HONG KONG HOUSING AUTHORITY

Building Information Modelling
Standards and Guidelines (HABIMSG)

- **Volume 1 of 2 – Introduction and Quick Guide**
- **Volume 2 of 2 – Detail Guide**
- **Annex**

Version 3.1

Important Points to Note:

The primary purpose of this Guide is to standardize various practices on the adoption of BIM in HA projects. It is therefore necessary to prescribe a set of standardized requirements on the modelling methodology and technical details for various parties engaged in HA projects to follow. Some of the requirements listed in this Guide are mandatory while others are recommended best practices only.

However, it is hereby stressed that whilst HA endeavours to ensure the accuracy and adequacy of the content in this Guide, user has the ultimate responsibility over the work they produced and should ensure that it meets project requirements. The use of this guide shall not relieve the users from such liabilities or obligations and HA accepts no responsibilities in this regards.

Comments and suggestions to improve this Guide are most welcome and should be addressed to:

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Volume 1 of 2 - Introduction and Quick Guide

PREFACE

Building Information Modelling (BIM) offers vast benefits in the life cycle of a construction project, from feasibility studies and planning to schematic design, detailed design, statutory submissions, cost estimation, tender and construction stages. BIM enables all stakeholders of a project including the project owner, building professionals of various disciplines and the contractor to share information of the project digitally, thereby allowing the team to effectively collaborate and maximise efficiency during the entire development of the project.

HA strongly believes that a coherent set of standards and guidelines is crucial to effective model building, information exchange, data and information compatibility and people communication. HABIMSG set to achieve following principles:

(a) HABIMSG is centred on the "**Purpose Driven BIM**" approach which guides user to implement BIM in a focused and efficient manner, achieving user's specific goals with minimum efforts and resources. The revamped HABIMSG is set to ensure that the "means" (i.e. modelling input) are driven by the "ends" (i.e. various output such as statutory submissions, quantity take-offs, environmental analyses, etc.) to achieve intended results.

(b) Most BIM Guides, due to their specific intended objectives and target readers, could either be too general, and may fail to give sufficiently detailed operational guidance to practitioners (such as technical officers), or too technical, which those in charge of project management (such as professionals) cannot comprehend. The HABIMSG aims to bridge this gap and provide a comprehensive guidance for all members of a project team (PT) in implementing a BIM project from start to finish. HABIMSG aims to facilitate all involved personnel in the PTs in providing their respective input and to offer the appropriate interface in bringing the project forward from commencement till completion.

(c) **Clarity:** The HABIMSG consists of two volumes with four levels, each with a specific target user group and purpose. See Section 2 – How to Use This Guide for definitions of levels, target users and contents.

(d) **Enhancement**: The new version of HABIMSG provides clear direction as user-oriented guide for users from different levels. A logical flowchart also shows the general workflow of different disciplines when develop their own design or carry on disciplinary collaboration.

(e) **Completeness**: In consultation with all disciplines in DCD, the missing elements and workflow of version 2.0 have been identified and remedied in this new version of HABIMSG.

(f) **Execution Focus**: Annex contains essential toolkits including Project-specific BIM Execution Plan (PxP) Template, modelling resources and training videos for users experienced with DCD projects to focus their execution efforts upon project kick-off.

(g) **Resource Indicator:** Experience shows there must be a realistic estimation of the resources required to implement BIM for the project and carry it through the entire project life cycle. Sustainability in this respect must be established at the commencement of the project. The BIM Use Card at Quick Guide Level 2 for each BIM application provides an indication of the relative implementation effort in terms of time on a 1 to 10 scale. For a BIM user who is unfamiliar with a particular BIM application being considered, this indicator helps the user to estimate the effort required based on the user's past experience in another BIM application which the user is familiar with.

(h) **Collaboration with Clear Ownership:** The Project Execution Plan sets an information management standard which delineates lines of responsibility, modes of communication, reporting procedures, approval and sign-off procedures, exchange or model sharing protocols, model coordination procedures/meetings, and model and drawing versioning procedures. The concept is to help users to achieve clear ownership, responsibility and liability. In practical terms, each team member or professional discipline would create their own models and files, for which they would have ownership of and data responsibility for the information contained therein. The models and files would provide easy identification of the respective author, and they would not be amended by any other team member or discipline without the owner's permission.

(i) **Drawing Production:** Although BIM is a superior tool to replace traditional 2D drafting, 2D drop-off from the 3D model is still crucial for the purposes of tendering, construction and statutory submissions. All file setting up and modelling methodologies in the revamped HABIMSG are designed to serve the drawing production purpose. Specifically, Detail Guide Level 4 provides guidance on drawing sheet compilation, drawing detail (e.g. view control, visibility overrides, view templates, annotation etc.) and preparation for publication.

Revision History

Version 1.0 (2009)

Included the following HA-specific standards and guidelines:

- BIM Library Components Design Guide Version 1.0 (July 2009)
- BIM Standards Manual Version 1.0 (November 2009)
- BIM User Guide Version 1.0 (Part I) (November 2009)
- BIM User Guide Version 1.0 (Part II) (November 2009)
- BIM Library Components Reference Version 1.0 (January 2010)
- Standard Approach of Modelling (SAM) for Creating Building Information Structural Model First Edition (March 2014)

Version 2.0 (2018)

- BIM Standards and Guidelines (HABIMSG) Version 2.0 (September 2018)

  This version was:

  i. A major revamp
  ii. Consolidate separate guides into one complete Standards and Guidelines
  iii. Aligned with CIC's Phase 1 BIM Standards

Version 3.0 (February 2022)

- BIM Standards and Guidelines (HABIMSG) Version 3.0 (February 2022)

  This version was a major revamp – refer to Table 2 in this Section.

Current Version and Date: **Version 3.1**

Important Note:

New versions of this HABIMSG would be issued from time to time and the date of each revision would be shown above.

Table 1 summarises all major updates of this Guide from **Version 3.0** to **Version 3.1,** and **Table 2** summaries all major updates from **Version 2.0** to **Version 3.0.** The list shall not be deemed exhaustive for all detailed updates to the Guide.

Table 1 – Summary of major updates from Version 3.0 to Version 3.1

Item No.	Section Revised	Description
General		
1	General	Generally revised for grammar, spelling and sentences refinement
2	General	Newly added symbols, with reference to section 1.4
Volume 2 of 2 – Detail Guide		
3	D3.2 Model Segregation Strategy	D.MET-2.3 Structural BIM Models (Previously named Structural Block Model) Updated with scenarios for Estate and External Works
4	D3.4 Project Setup	D.MET-4.2 Project Coordinates (Previously named Survey Point & Project Base Point) D.MET-4.3 True North & Project North D.MET-4.5 Link Revit File Update to reflect Revit function changes on coordinates setup and display of Internal Origin since Revit version 2020
		D.MET-4.4 Grids and Levels Add requirements that only one set of Structural Levels shall be based in the project
		D.MET-4.6 Link CAD File of Survey Map Revised to indicate "Auto-detect" for Import Units is not recommended, and add reference to BIM Standards and Modelling Guidelines published by the Independent Checking Unit (ICU)
5	D4.3 Architecture SAM	Generally revised
6	D4.8 Water Services SAM	DM-P 04 Add Pipe Fittings Generally revised
7	D6 BIM Quality Assurance	Generally revised to tie in with updates made on the HA BIM Quality Assurance (QA) Checklists
Annex		
8	ANN-1.7 Common Errors and Recommendations	Newly added section to consolidate on common modelling errors and recommendations based on findings of model audits carried out by the BIM Services Provider.

Table 2 – Summary of major updates from Version 2.0 to Version 3.0

Item No.	Section Revised	Description
General		
1	General	Content and wordings updated to make the Guide applicable for the use by PSPs and Contractors, and cover both Design and Construction Stages.
2	General	Enhance the use of symbols stated in Section 1.4 to emphasize "Must-do", "Advisory", "Attention", "Reference" and "HA-Specific" across the whole Guide.
3	General	Updated contents to reflect changes to Revit 2018
4	General	Grammar and spelling
5	General	Style adjustments and font enlargements

Revision History

Item No.	Section Revised	Description
General		
6	Important Points to Note and Copyright Notice	Newly added to each volume based on previous Section 1.3 and 1.4
Table of Content		
7	Table of Content	Revised to improve structure and hierarchy of the Guide. Section numbering revised accordingly. *(Section numbers shown in this table refer to the ones used in the current version of HABIMSG.)*
Volume 1 of 2 – Introduction and Quick Guide		
8	Preface	Generally revised
9	Revision History	Newly added Revision History to replace Appendix II – Comparison of HKHA BIM Guides in V2.0
10	1. Introduction	Generally revised
11	1.1 Background	Omitted and merged into 1. Introduction
12	1.1 The committee	Previously as Section 1.2; generally revised
13	-	Previous Section 1.3 Disclaimer omitted and merged into “Important Points to Note” for each volume.
14	-	Previous Section 1.4 Copyright omitted and merged into “Copyright Notice” for each volume
15	1.2 Executive summary	Previously as Section 1.5; generally revised and mention of Annex as supplementary resources.
16	1.3 Reference	Previously as Section 1.6; generally revised and updated for recent publications.
17	1.4 Symbols and Conventions	Previously as Section 1.8
18	1.5 Glossary	Previously as Section 1.7 Added definition of additional BIM and HA terminologies
19	2.1 Purpose Driven BIM	Minor wording adjustments
20	2.2 “Must Do” items of this Guide	Newly added to replace “Concept of M.I.B.”
21	2.3 Structure of this Guide	Generally revised and simplified to tie in with revision to other sections and improve clarity. Added explanation for Why, What, Who, When, Where and How
22	Explained	Explained: Quick Guide Level 1-3 – Revised to tie in with the updates on the sections, and combined Levels 1-3 “Explained” and “How to Use” into the same section Explained: Detail Guide Level 4 – revised to clarify that Detail Guide include sections other than Standard Approach of Modelling (SAM). Explained: Annexes – revised to tie in with the updates on the section Explained: Appendices omitted
23	2.4 Starting a BIM Project	Previously as 2.3 How to start a BIM Project; generally revised
24	Quick Guide – Level 1	Reformatted BIM Use Overview table. BIM Use definition and adoption follow DevB Technical Circular BIM Uses nomenclature and align with PSP Agreement / BIM Preliminaries of Works Contract.
25	Quick Guide – Level 2	Reformatted BIM Application Detail table BIM application and tasks examples follow the order of BIM Use in Level 1 table, i.e. DevB Technical Circular BIM Uses nomenclature and align with PSP Agreement / BIM Preliminaries of Works Contract.
26	Quick Guide – Level 3	Reformatted and newly added Overall BIM Workflow and Individual BIM Workflows
Volume 2 of 2 – Detail Guide		
27	Detail Guide – Level 4	Generally restructured for clarity
28	D1. Level of Development	Previously as Section 3; Revised LOD definitions and sample Updated LOD responsibility matrixes
29	D2. BIM Collaboration	Previously as Section 4; generally revised based on latest HA-specific practices Newly added D.Col-2.3 Placehoders of Architectural and Structural Model Elements
30	D3. Common Modelling Strategy	Previously as Section 5 Modelling Methodology; generally revised based on latest HA-specific practices Newly added D3.2 Model Segregation Strategy for design and construction modelling D3.3 System Setup – previously as D.MET-2 D3.4 Project Setup – previously as D.MET-3 D3.5 From Modular Flat to Project – previously as D.COL-3
31	D4. Standard Approach of Modelling (SAM)	Previously as Section 6; generally revised based on latest HA-specific practices
32	D5. Presentation Style	Previously as part of Section 7; generally revised based on latest HA-specific practices
33	D6. BIM Quality Assurance	Newly added guidelines on Quality Assurance

Revision History

Item No.	Section Revised	Description
Annex		
34	ANN-1 HA BIM Resource	Newly added to consolidate all HA BIM Resources as the Annex
35	ANN-1.1 HA BIM Project Execution Plan (PxP) Template	Previously as Appendix I – Revised HA BIM PxP template
36	ANN-1.2 HA BIM Quality Assurance (QA) Checklists	Newly added HA BIM Quality Assurance (QA) Checklists
37	ANN-1.3 HA Modelling Resources	Newly added consolidated location for modelling resources including HA Project Model Templates, HA Family Library, HA Shared Parameter Lists, Abridged Version of Modular Flat Design (MFD) Templates
38	ANN-1.4 HA BIM QTO Scope	Newly added HA BIM QTO Scope
39	ANN-1.5 BIM Training Videos	Newly added list of training videos by DCD on HA modelling and by ICU on GBP, Foundation Plan and Superstructure Plan Submission
40	ANN-1.6 I.T. Setup Recommendation	Previously as Annex 9; updated with current hardware specification and generally revised
41	-	Previous Annex 1-8 BIM Studies done by various professional discipline in DCD of the HA omitted
42	-	Previous Appendix II Comparison of Previous HKHA BIM Guides and Guides omitted
43	-	Previous Appendix III HKHA Family Library Component omitted

1 INTRODUCTION

The Development and Construction Division (DCD) is a multi-disciplinary division with professionals from Architecture, Structural Engineering, Building Services Engineering, Civil Engineering, Geotechnical Engineering, Quantity Surveying, Landscape Architecture, Land Surveying, and Planning. With the implementation of Building Information Modelling (BIM) in DCD, BIM models would be developed and carried throughout the project lifecycle from feasibility studies, schematic design, detailed design, construction and ultimately used for asset management /maintenance. Standards and guidelines are important for effective model building, information exchange, data and information compatibility and communication between in-house staff, consultants, Professional Services Providers, contractors, BIM Services Providers and all other parties involved in DCD projects.

The HABIMSG are designed to improve the process of design information production, management and exchange.

Throughout the years, HA has published 10 sets of standards and guidelines which focused on specific BIM applications. As these standards and guidelines were prepared by different working teams or on ad hoc basis, the contents may not be coherent and, in some cases, may not represent HA's latest preferred BIM practices. In light of the rapid development in BIM technology, there is a need to consolidate the previous publications into a comprehensive BIM Standards and Guidelines for both HA staff and interfacing parties to follow. Thus from 2015, three consecutive consultancies were carried out to revamp existing HA BIM publications and produce a comprehensive Housing Authority BIM Standards and Guidelines (HABIMSG).

For effective deliver of the standards and guidelines, content of this Guide, particularly on technical level, may inevitably touch upon software of specific brand names. HA currently uses Revit as the main BIM software, which is also the reference of this Guide as far as software operation is concerned. Nonetheless, HA adopts a **product neutral policy on the use of software.**

1.1 The Committee

The following parties were consulted during the development of the HABIMSG

1. BIM Project Steering Committee (BIM PSC); and
2. Independent Checking Unit (ICU).

The Editorial Board included representatives from:

1. The BIM Service Team (BIMST);
2. AECOM Asia Company Limited (AECOM);
3. Platform Design Associates Limited (Platform), subconsultant to AECOM; and
4. Advanced Construction Information Development Limited (A.C.I.D.).

1.2 Executive Summary

HABIMSG ensures all involved parties are clearly aware of the opportunities and responsibilities associated with the incorporation of BIM into the project workflow. It defines the appropriate Uses for BIM on a project (e.g. design authoring, design review, and 3D coordination), along with a detailed design and documentation of the process for executing BIM throughout a project's lifecycle. By following the procedures set out, the team can follow and monitor their progress against the execution plan to gain the maximum benefits from BIM implementation.

HABIMSG provides a structured procedure for implementing BIM within HA:

1. **Quick Guide Level 1** — **BIM Use Overview**: Identify and define possible BIM uses that are commonly adopted throughout the project lifecycle.
2. **Quick Guide Level 2** — **BIM Application Detail**: Identify applicable specific BIM application and task examples, at which stages to apply the BIM application detail and indicator of the relative effort required for completing the tasks.
3. **Quick Guide Level 3** — **BIM Workflow**: Describe the execution process for each BIM application
4. **Detail Guide Level 4**: — Implement the standards and procedures for LOD, collaboration, common modelling strategy, standard approach of modelling (SAM) and presentation, BIM Quality Assurance, etc.
5. **Annex** — Contain HA BIM Resources and indication on where to obtain these supplementary files to facilitate BIM implementation, which include HA BIM Project Execution Plan (PxP) Template, HA BIM Quality Assurance (QA) checklists, modelling resources (HA Project Model Templates, HA Family Library, HA Shared Parameter Lists, Abridged Version of Modular Flat Design (MFD) Models), HA BIM QTO scope, BIM Training Videos and I.T. Setup Recommendation.

1.3 Reference

In preparing the contents of this Guide, the following local and international standards have been reviewed and taken consideration as general references only.

Document	Published By	Date Published
Technical Circular (Works) No. 12/2020 and previous versions– Adoption of Building Information Modelling for Capital Works Projects in Hong Kong	Development Bureau (DEVB)	2020-12
Guidelines for using Building Information Modelling in General Building Plans Submission	Buildings Department (BD)	2019
CIC BIM Standards – General (Version 2)	Construction Industry Council (CIC)	2020-12
CIC BIM Standards for Preparation of Statutory Plan Submissions	CIC	2020-12
CIC BIM Standards – Architecture and Structural Engineering (Version 2)	CIC	2020-12
CIC Building Information Modelling Standards – Mechanical, Electrical and Plumbing	CIC	2019-08
CIC Building Information Modelling Standards – Underground Utilities	CIC	2019-08
CIC Production of BIM Object Guide – General Requirements	CIC	2019-08
CIC BIM Exchange Information Requirements (EIR) Template (BIM Specifications)	CIC	2020-12
BIM Standards and Modelling Guidelines for Statutory and Building Control Submission of General Building Plan, Foundation Plan and Superstructure Plan	Independent Checking Unit (ICU)	2020-09
BS EN ISO 19650-1:2018 BS EN ISO 19650-2:2018	BSI Group (BSI)	2018
Collaborative production of information Part 4: Fulfilling employer's information exchange requirements using COBie – Code of practice (BS 1192-4:2014)	BSI	2013
National BIM Standard – United States Version 3	National Institute of Building Sciences buildingSMART alliance®	2015

Document	Published By	Date Published
HK Standard Method of Measurement of Building Works (SMM4), Fourth Edition, Revision 2018	Hong Kong Institute of Surveyors (HKIS)	2018
BIM Contract Conditions – Conditions of Contract for Building Information Modelling (BIM)	HKIS	2020-04
Building Information Modelling for Asset Management (BIM-AM) Standards and Guidelines Version 2.0	Electrical and Mechanical Services Department (EMSD)	2019-01
LOD Specification 2020	BIM Forum	2020-12
Singapore BIM Guide (Version 2)	Building and Construction	2017
Autodesk Revit Model Performance Technical Note (Autodesk Technical Papers)	Autodesk	2016
Mastering Autodesk Revit MEP	Autodesk	2015

1.4 Symbols and Conventions

A series of symbols has been devised for HABIMSG which requires users' attention. The symbols being applied throughout HABIMSG either:

(a) Signify the importance of the relevant sections, or
(b) Are contents that carry specific implication.

Definitions of the symbols are as follows:

Must Do		**Contents that must be followed**
Advisory		**Recommended practices**
Under Development		**Contents that are still under development**
Attention		**Additional remarks that require extra attention – either denoting common mistakes or addressing software function limitation**
Reference		**References to other sections or documents**
HA-specific		**HA-specific practices and must be followed for HA projects**
HA-Training Video		**HA-Training Video (produced by BIMST and ICU)** **X refer to the corresponding tutorial video's chapter**

1.5 Glossary

#	***"3D" BIM***	Modelling & documentation. Utilizing BIM as a tool to develop and deliver design for all disciplines in a 3D format with intelligence built into the delivery to be harvested and/or utilized at a later time.
	"4D" BIM	Integration for construction. Building upon the "3D" service by adding timeline and schedule attributes to ensure on-time, smooth constructability and delivery of projects.
	"5D" BIM	Cost estimation. Not just about simulating cost on a BIM model, but re-defines the communication with the owners. Owners are offered live up-to-date information that helps see the current cost and compare it to the estimated total target cost of their project, as well as interim costs against design during design phases.
	"6D" BIM	Building Lifecycle Integration. Offer integrated, perhaps proprietary, facility management solutions to clients by utilizing BIM information from 3D, 4D, and 5D to integrate in the operation, maintenance and future renovations of buildings.
	3D/4D/5D/6D	Descriptions of BIM implementation with increasing 'richness' of associated information & functionalities.
A	***AEC***	A collective acronym of Architecture, Engineering and Construction for the built environment.
	AM	Asset Management
B	***BIM***	"Building Information Modelling" - The process of generating and managing building data during the building or assets life cycle. It is a new way of working using new technology to facilitate project management, better construction process control, cross-disciplinary collaboration, communication with external stakeholders, decision support and risk management.
	BIM model	BIM Model is the model produced by utilising BIM software and through the process of Building Information Modelling. 1. **Design BIM Model** means a BIM model created at design stage for the Works 2. **Construction BIM Model** means a BIM model developed by the Contractor for the Works at construction stage. 3. **Federated BIM Model** means a combined BIM model that has been compiled by amalgamating several different models into one. 4. **As-built BIM Model** means a BIM model shall be updated based on the final approved construction information that has been built, checked and shall be accurate as shown on the as-built drawings / models. **Native format**: The file format that a model authoring software is agreed to work with. It is "editable", "readable" and "overwritable" files, such as ".rvt" for Revit, ".pln" for ArchiCAD, ".bsn" for Civil 3D etc. **Viewer format**: The file format that a model review software is agreed to work with, such as ".nwc", ".nwf". ".nwd" for Navisworks, ".che" for Fuzor etc. **Open format**: The file format for storing digital data that can be opened and implemented by both proprietary and free and open-source software, e.g. IFC format.
	BIMSP	Building Information Modelling Services Provider.

B	***BIMST***	Building Information Modelling Service Team established in 2009 under Business Information and Technology Unit (BITU) of DCD to provide BIM central support and advise project teams of the implementation of BIM technology.
	BIM Software	Computer applications that create, modify, integrate, and/or manipulate digital BIM models in whole or parts.
F	***BSI***	BSI Group, also known as British Standards Institution.
B	***Building Information Management***	Synonym to "Building Information Modelling" with emphasis on the requirement to manage/structure the information.
C	***CDE***	Common Data Environment. Single source of information for any given project, used to collect, manage and disseminate all relevant approved project documents for multi-disciplinary teams in a managed process.
	CFD	Computational Fluid Dynamics. A branch of fluid mechanics that uses computer programs to simulate the behaviour of fluids and gases when interacting with surfaces. In an architectural context CFD is used to analyse airflows around buildings, ventilation patterns, stack effects in multi-storey buildings, fir/smoke behaviour, etc.
	CIC	Construction Industry Council.
	COBie	Construction Operations Building Information Exchange (COBie) is a specification for the capture and delivery of design/ construction information to Facility Managers. COBie Specifications can be collated using a spreadsheet template or a COBie-enabled software solution.
D	***DCD***	Development and Construction Division.
E	***ELSW***	Excavation and lateral support
G	***GIS***	Geographic Information System.
I	***ICU***	Independent Checking Unit.
	IFC Format	The Industry Foundation Classes (IFC) data model is intended to describe building and construction industry data. It is a platform neutral, open file format specification that is not controlled by a single vendor or group of vendors. It is an object-based file format with a data model developed by buildingSMART (formerly the International Alliance for Interoperability, IAI) to facilitate interoperability in the architecture, engineering and construction (AEC) industry, and is a commonly used collaboration format in Building information modelling (BIM) based projects.
L	***LOD***	Level of Development (LOD) is the term generated and used in the HA's BIM Standards based on the existing HD CAD standards. New elements were added in developing HABIMSG to include additional features provided in BIM which did not exist in two-dimensional (2D) environment. The LOD mainly focus on modelling requirements and do not integrate the Cost, Schedule or Performance Criteria inputs for Analysis. In this version of HABIMSG, LOD is further differentiated into **Level of Graphics (LOD-G)** and **Level of Information (LOD-I)**. Refer to Vol. 2 – Detail Guide, Section 1 Level of Development (LOD)
O	***openBIM***	openBIM is a universal approach to the collaborative design, realization and operation of buildings based on open standards and workflows. openBIM is an initiative of buildingSMART International and several leading software vendors using the open buildingSMART Data Model.
	OmniClass	The OmniClass Construction Classification System is a classification system for the construction industry, developed by the Construction Standards Institute (CSI) and is used as a classification structure for electronic databases. As the basis of its tables, OnmiClass incorporates other existing systems currently in use, including MasterFormat for work results, Uniformat for elements and EPCI (Electronic Product Information Cooperation) for structuring products.
	O&M	Operation and Management
P	***Point Cloud***	A set of data points in some coordinate system.
	PSP	Professional Services Provider. 1. **ASP** Architectural Services Provider 2. **ESP** Engineering Services Provider 3. **BSESP** Building Services Engineering Services Provider
	PT	Project Team.
	PQS	Project Quantity Surveyor
	PxP	Building Information Modelling Project Execution Plan. A document, as a management tool, to show the roadmap of the use of BIM in the subject project by defining various BIM tasks and process. 1. **Design Stage BIM PxP** means a BIM Project Execution Plan developed by the design team (including Housing Department's staff and/or PSPs engaged by the Employer) for BIM project management. 2. **Construction Stage BIM PxP** means a BIM Project Execution Plan developed by the Contractor / construction team for BIM project management.
Q	***QS***	Quantity Surveying
	QTO	Quantity Take-off for preparation of Bills of Quantities and other tender documents
S	***Spatial Analysis***	The process of examining the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques in order to address a question or gain useful knowledge.
	Spatial Data	Information about the locations and shapes of geographic features and the relationships between them, usually stored as coordinates and topology.
	SAM	Standard Approach of Modelling.
T	***Terrain***	Vertical dimension of land surface.

2 HOW TO USE THIS GUIDE

2.1 Purpose Driven BIM

A wide variety of BIM Uses for the construction industry exist, as new applications continue to be developed and adopted over time. Each BIM application has its own requirements on modelling methodologies, types of information required and implementation characteristics, all of which may differ between different BIM applications.

Careful planning and coordination is essential from the outset of any BIM Projects to first determine what BIM applications are required to meet individual project goals, types of information to be included and implementation strategies, before proceeding to modelling activities. This will ensure that BIM models are authored and coordinated properly, contain all necessary information, and can be carried through the entire project life cycle to deliver all BIM and project goals. This **Purpose Driven BIM** approach is essential in understanding the fundamental purposes of each BIM-related activity to optimise team resources and minimise effort.

A simple example is to avoid modelling excessive details which serves no particular purpose, but increases file sizes and resources with no apparent benefit.

2.2 "Must Do" items of this Guide

Important note

While certain contents of the HABIMSG serve as general guidance or recommended practices, user of this Guide should pay particular attention to contents with the **"Must-Do" symbol** shown at the left hand side of the section heading or paragraph. The symbol denotes **standards, methods and procedures that must be followed** in order to achieve the intended results.

2.3 Structure of this Guide

Following the principles of Purpose Driven BIM, the HABIMSG aims to be a comprehensive guide for PTs / PSPs / Contractors / BIMSPs to identify BIM Uses adoption by HA projects and provide step-by-step guidance on application details, corresponding workflows, collaboration methods, and standard approach to modelling, etc. The structure of HABIMSG is divided into four sequential levels, each with its own functions, and further supplemented by the Annex, for available HA resources and files on top of content of this Guide.

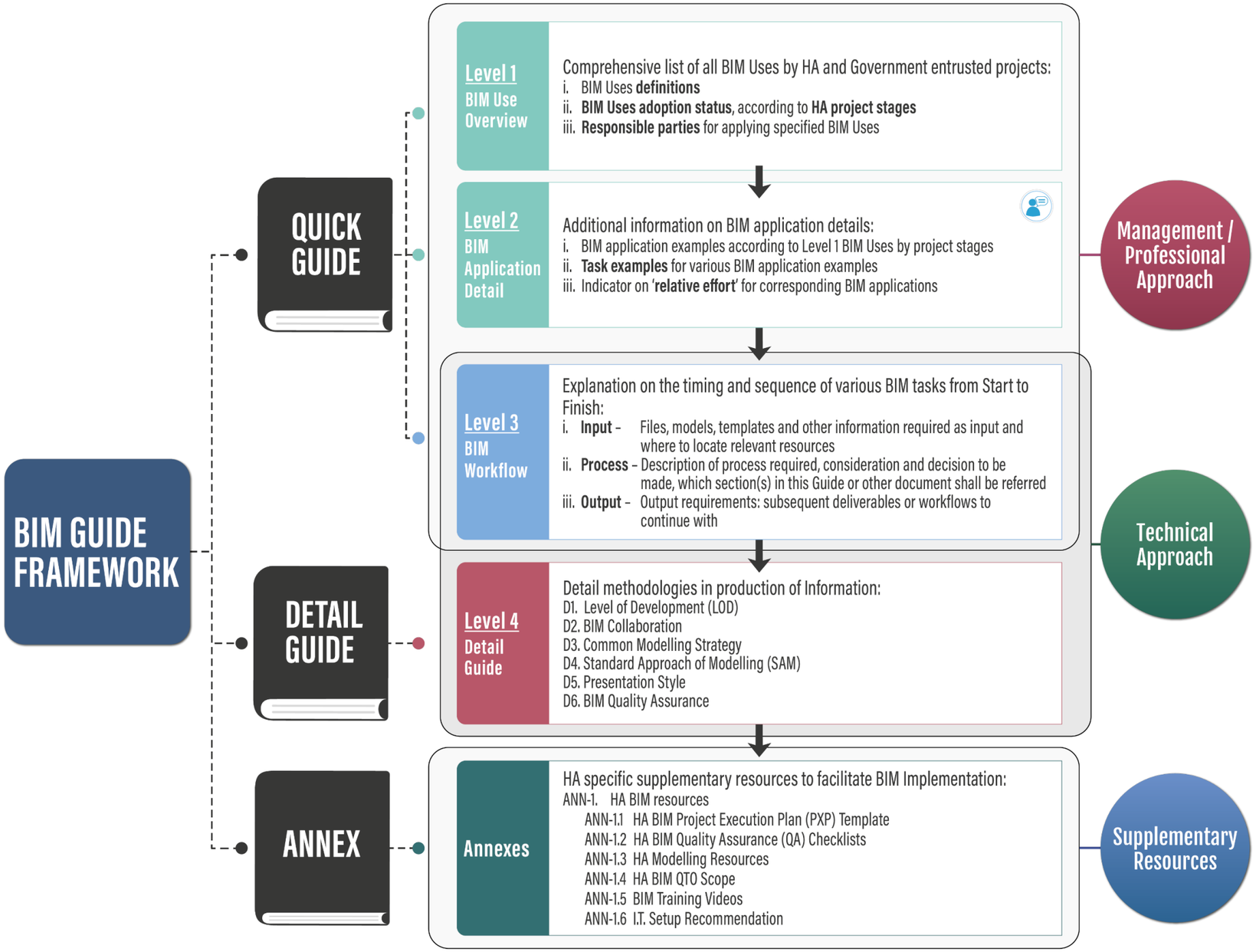


Figure 1 BIM Guide Framework

In summary, the guide addresses the following fundamental questions:

- **Why** employ specific BIM uses?
- **What** BIM tasks are applicable to this project?
- **Who** is responsible for executing specific BIM tasks?
- **When**, and in what sequence, shall the tasks take place?
- **Where** shall BIM authoring and other BIM activities take place?
- **How** to execute the tasks step-by-step?

The guide answers the above questions through a logical sequential approach from Level 1 to Level 4:

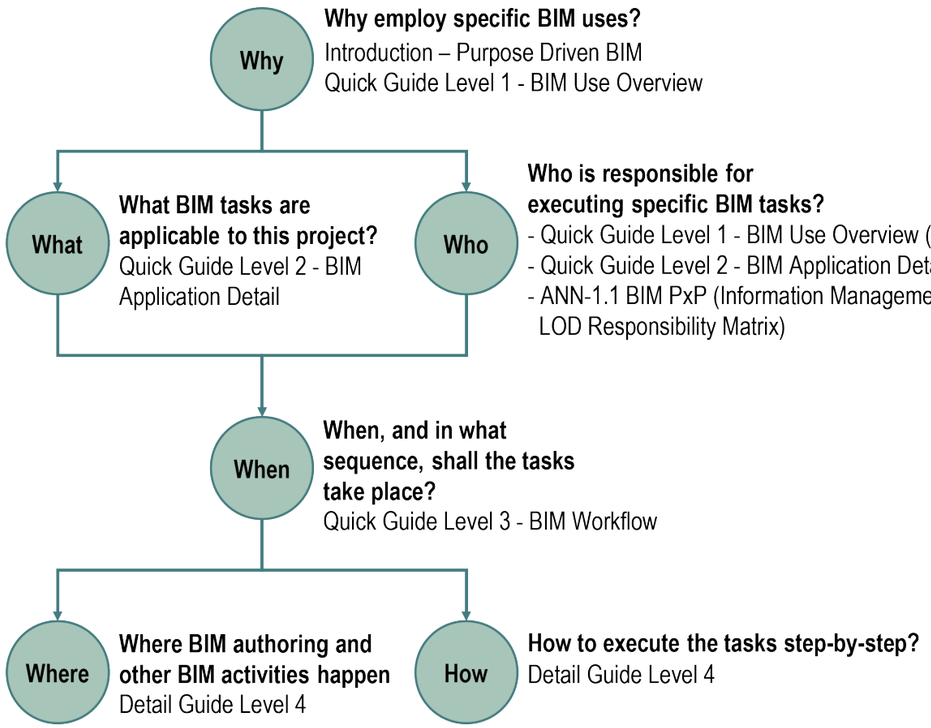


Figure 2 Why, What, Who, When, Where and How in HABIMSG

Explained: Quick Guide Level 1 – BIM Use Overview

Purpose of Level 1

1. **BIM Use Definition**: A quick overview of how BIM Uses are defined in HA.
2. **BIM Use Adoption:** To indicate whether each BIM Use shall be adopted (Mandatory) for HA DCD projects at HA-specific Work Stages. BIM Use adoption for Government Entrusted Works has also been provided according to DevB Technical Circular (Works) No. 12/2020 for reference.

Level 1 BIM Use Overview table presents the BIM Uses in accordance to **DevB Technical Circular (Works) No. 12/2020, as well as HA BIM PSP Agreement / Preliminaries Specification of Works Contracts**. These uses are organised by **BIM Uses,** split for corresponding **Responsible Party** against **Work Stages in HA (Project Timeline)**.

Responsible Party

BIM Use definition and adoption are divided for responsible parties, indicating **who** (Designer or Contractor) to be responsible for the corresponding portion of BIM Uses at particular Work Stages.

Designer – Definitions and adoption applicable to BIMSP and In-house Architectural (A), Structural Engineering (SE) and Building Services Engineering (BSE) teams or PSP (ASP, ESP, BSESP).

Contractor – Definitions and adoption applicable to Foundation and Building Contractor.

Project Timeline

Project stages are listed. Definition is organised by commonly defined work stages (Inception & Feasibility, Design and Construction stages), while Adoption is further broken down into HA specific work stages.

How to Use

The **Level 1 - BIM Use Overview** worksheet shall be filed in BIM Project Execution Plan (PxP). Refer to **ANN-1.1** of HABIMSG Annex.

BIM Uses in accordance to DevB Technical Circular (Works) No. 12/2020 and HA BIM PSP Agreement / Preliminaries Specification of Works Contracts.

Responsible Party indicates who (Designer / Contractor) shall be responsible for the BIM Uses at certain Work Stages.

BIM Use Definition and Adoption by Work Stages in HA. Definition is organised by commonly defined work stages (Inception & Feasibility, Design and Construction stages), while Adoption is further broken down into HA specific work stages.

BIM Use Definition and Adoption by Work Stages in HA

BIM Uses (With reference to DEVB BIM Uses - Technical Circular (Works) No. 12/2020)	Responsible Party*	**Inception & Feasibility** Stage		**Design** stage						**Construction** Stage		
		DevB TC (Works) 12/2020	Inception & Feasibility (IF)	DevB TC (Works) 12/2020	Schematic Design (SD)		Detailed Design (DD)		Tender (TE)	DevB TC (Works) 12/2020	Construction (CS)	Completion (As-Built (AB))
					Pre BC		Post BC					
					PDRC 2	BC	ICU (GBP)	ICU (PIL)	DDRP	TC		
1 Design Authoring	Designer	M	To use BIM authoring software to create and develop the design and to support other BIM Uses.	M	To use BIM authoring software to create and develop the design and to support other BIM Uses.						To use BIM authoring software to create and develop the design and to support other BIM Uses.	
			M		M	M	M	M	M	M	M	
	Contractor										To use BIM authoring software to create and develop the items where the design responsibility is borne by the Contractor and to support other BIM Uses.	
											M	
2 Design Reviews	Designer	M	To use BIM for stakeholders to view a model, images and drawings from the models or animated walkthroughs of the project, provide feedback and validate numerous design aspects, such as meeting the project requirements and previewing spaces and layouts in digital deliverables, as far as practicable.	M	To use BIM for stakeholders to view a model, images and drawings from the models or animated walkthroughs of the project, provide feedback and validate numerous design aspects, such as meeting the project requirements and previewing spaces and layouts in digital deliverables, as far as practicable.						To use BIM for stakeholders to view a model, images and drawings from the models or animated walkthroughs of the project, provide feedback and validate numerous design aspects, such as meeting the project requirements and previewing spaces and layouts in digital deliverables, as far as practicable.	
			M		M	M	M	M	M	M	M	
	Contractor										To use BIM for design roview.	
											M	
3 Existing Conditions Modelling	Designer	M	*(Applicable to Architectural Sections and ASP only)* To create a BIM model of the existing site conditions within the project boundary and surrounding area within a 50m radius. *(Applicable to SE Sections and ESP only)* To create a BIM model of the existing site conditions and the underground geological profiles (including surrounding area within 50m radius).	M	*(Applicable to Architectural Sections and ASP only)* To create a BIM model of the existing site conditions within the project boundary and surrounding area within a 50m radius. *(Applicable to SE Sections and ESP only)* To create a BIM model of the existing site conditions and the underground geological profiles (including surrounding area within 50m radius).					M	*(Applicable to Architectural Sections and ASP only)* To create a BIM model of the existing site conditions within the project boundary and surrounding area within a 50m radius. *(Applicable to SE Sections and ESP only)* To create a BIM model of the existing site conditions and the underground geological profiles (including surrounding area within 50m radius).	
			M		M	M	M	M	M	M	M	
	Contractor										To create a 3D model of the existing site conditions (including surrounding area within 50m radius) for facilitating construction planning.	
											M	
4 Site Analysis	Designer	M	*(Applicable to Architectural Sections only)* To use BIM and/or Geographic Information System (GIS) tools to evaluate the site and determine the most optimal location, position, orientation, road alignment, etc. for the project.	M	*(Applicable to Architectural Sections and ASP only)* To use BIM and/or Geographic Information System (GIS) tools to evaluate the site and determine the most optimal location, position, orientation, road alignment, etc. for the project.					-		
			M		M	M						

BIM Use Adoption for Government Entrusted Works - DevB Technical Circular (Works) 12/2020 or subsequent revisions shall be referred.

BIM Use Adoption for HA Works - e.g. context in these boxes indicates *Design Review* shall be *Mandatorily adopted* for Designer across all *six HA-specific design work stages*.

BIM Use definition - e.g. content in this box indicates *BIM Use definition* of *Design Review* applicable for *Designer* during *Design Stage*.

Figure 3 Level 1 BIM Use Overview (Definition and Adoption) Explained

Explained: Quick Guide Level 2 – BIM Application Detail

Purpose of Level 2

(Note: Level 2 table provides examples for BIM application and corresponding tasks and serves as recommended best practices only, i.e., they shall not be deemed as mandatory requirements nor be exhaustive. For Mandatory BIM uses, please refer to relevant clauses in project-specific PSP, BIMSP and Works Contracts / Agreement.)

1. To give directions to PTs / PSPs / Contractors on what BIM application and task examples would be involved at certain work stages.
2. To enable the BIM Manager to estimate resources required for a desired BIM workflow.

Level 2 BIM Application Detail is an expanded view of Level 1 which provides more specific **examples of BIM application and corresponding task** that are commonly adopted or deemed applicable in HA. The table is sorted and numbered in accordance to Level 1 table for ease of reference.

The detailed information covers the following:

1. Involved disciplines responsible for authoring and updating the BIM model.
2. **Relative effort** in terms of time on a 1 to 10 scale with 10 being most effort intensive. The numbers represent relative levels rather than man days. For BIM applications that the users are less familiar with, this indicator helps users to estimate the effort required from the BIM applications they are already familiar with by comparing the relative effort.
3. The efforts are indicated by stage:
   a. IF: Inception & Feasibility
   b. SD: Schematic Design
   c. DD: Detailed Design
   d. TE: Tender
   e. CS: Construction
   f. AB: As-built

BIM Uses in accordance to Level 1 Table (DevB Technical Circular (Works) No. 12/2020 and HA BIM PSP Agreement / BIM Preliminaries Specification of Works Contracts).

BIM Application Examples contains breakdown of BIM-related activities correspond to the BIM Use.

Task Examples list out applicable tasks under each BIM Application Examples.

Project Stages in this table are sequential in a project timeline and HA-specific.

Relative Effort is measured in terms of time by stage per BIM Application Examples on 1 to 10 scale, with 10 being the most effort-intensive.

1	**Design Authoring**												
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)										
			IF		SD		DD		TE		CS		AB
1.1	Architectural												
1.1.1	Development Parameters	· Conceptual mass	√		N/A		N/A		N/A		N/A		N/A
		· Plot Ratio calculation	√		√		√		N/A		N/A		N/A
		· Building height study	√	(2)	√	(3)	√	(3)	N/A		N/A		N/A
		· Flat mix & efficiency	√		√		√		N/A		N/A		N/A
		· Green ratio	√		√		√		N/A		N/A		N/A
1.1.2	Typical Floors	· Make use of standard modular flat from D&S to assemble block layout	√		√		√		N/A		N/A		N/A
		· Project team to make adjustment to MFD if required											
		· Design of non-standard layout (corridor, lobby, plant room, etc.)	√		√		√		√		N/A		N/A
		· Colour scheme	N/A	(3)	√	(4)	√	(5)	√	(6)	N/A	(6)	N/A
		· Plans, sections & elevations (modular flat and other non-standard elements)	N/A		√		√		√		√		N/A
		· Architectural schedules	N/A		N/A		√		√		√		N/A
		· Exterior tile / cladding layout	N/A		N/A		N/A		√		√		N/A
		· Designer to continuously update drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√		N/A
1.1.3	Remaining Area (Podium, external areas, roof, footbridges & covered walkway, etc.)	· Design of non-standard layout (corridor, lobby, plant room, etc.)	√		√		√		√		N/A		N/A
		· Colour scheme	N/A		√		√		√		N/A		N/A
		· Plans, sections & elevations (all applicable elements)	N/A		√		√		√		√		N/A
		· Design in 3D	N/A	(4)	√	(5)	√	(6)	√	(7)	√	(7)	N/A
		· Street furniture layout & schedules	N/A		√		√		√		√		N/A
		· Architectural schedules	N/A		N/A		√		√		√		N/A
		· Exterior tile / cladding layout	N/A		N/A		N/A		N/A		√		N/A
		· Designer to continuously update drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√		N/A
1.1.4	Modular Flat Assembly	· Flat size and provision options	√		√		√		N/A		N/A		N/A
		· Plans, sections & elevations (all applicable elements)	√		√		√		√		√		N/A
		· Toilets and kitchen layout	√		√		√		√		√		N/A
		· Precast façade design	N/A	(3)	√	(4)	√	(5)	√	(6)	√	(6)	N/A
		· Precast façade drawings & schedule	N/A		N/A		N/A		√		√		N/A
		· Precast façade shop drawings & mockup	N/A		N/A		N/A		N/A		√		N/A
		· Architectural schedules	N/A		N/A		N/A		√		√		N/A
		· Designer to continuously update drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√		N/A
1.1.5	Interior	· Plans and internal elevations	N/A		√		√		√		√		N/A
		· Domestic lobbies, lift interiors, etc. design options	N/A		√		N/A		N/A		N/A		N/A
		· Domestic lobbies, lift interiors, etc.	N/A		N/A	(4)	√	(5)	√	(6)	√	(6)	N/A
		· Interior fitment schedules	N/A		N/A		N/A		√		√		N/A
		· Interior tile / cladding setting out	N/A		N/A		N/A		N/A		√		N/A

BIM Application template suggests which project stages each task example shall be applicable and the relative effort of each BIM Application Example.

Figure 4 Level 2 BIM Application Detail Explained

How to Use

1. The BIM Manager shall form a general idea of the degree of complexity and involvement of the desired applications in terms of collaborating parties, information required and expected effort.
2. The BIM Manager shall liaise with involved disciplines in meetings for their consensus on providing necessary information and BIM models for the desired BIM uses.
3. Project technical officers shall review the BIM model sets involved and advise the project team leader regarding the feasibility of carrying out the desired BIM workflow at the technical level.
4. After reviewing the above, project team leader shall have adequate information and rationale to select BIM applications to be adopted.

The completed worksheet shall be filed in BIM Project Execution Plan (PxP). Refer to **ANN-1.1** of HABIMSG Annex.

Explained: Quick Guide Level 3 – Overall BIM Workflow

Purpose of Level 3

1. To illustrate the overall HA-specific workflow via Overall Workflow Diagram
2. To illustrate the sequence of individual workflows within the overall diagram

How to Use

PTs / BIMSPs / PSPs / Contractors shall use the overall workflow as an index which illustrates the hierarchy of and relationship between individual workflows. There are eight major Workflow Groups:

Q3-01 Project Setup
Q3-02 Individual Discipline Input
Q3-03 Interdisciplinary Coordination
Q3-04 Documentation and Presentation
Q3-05 BIM Quality Control and Quality Assurance (QC / QA)
Q3-06 Construction and As-built
Q3-07 Handover of BIM Model at Works Completion
Q3-08 Project Archive

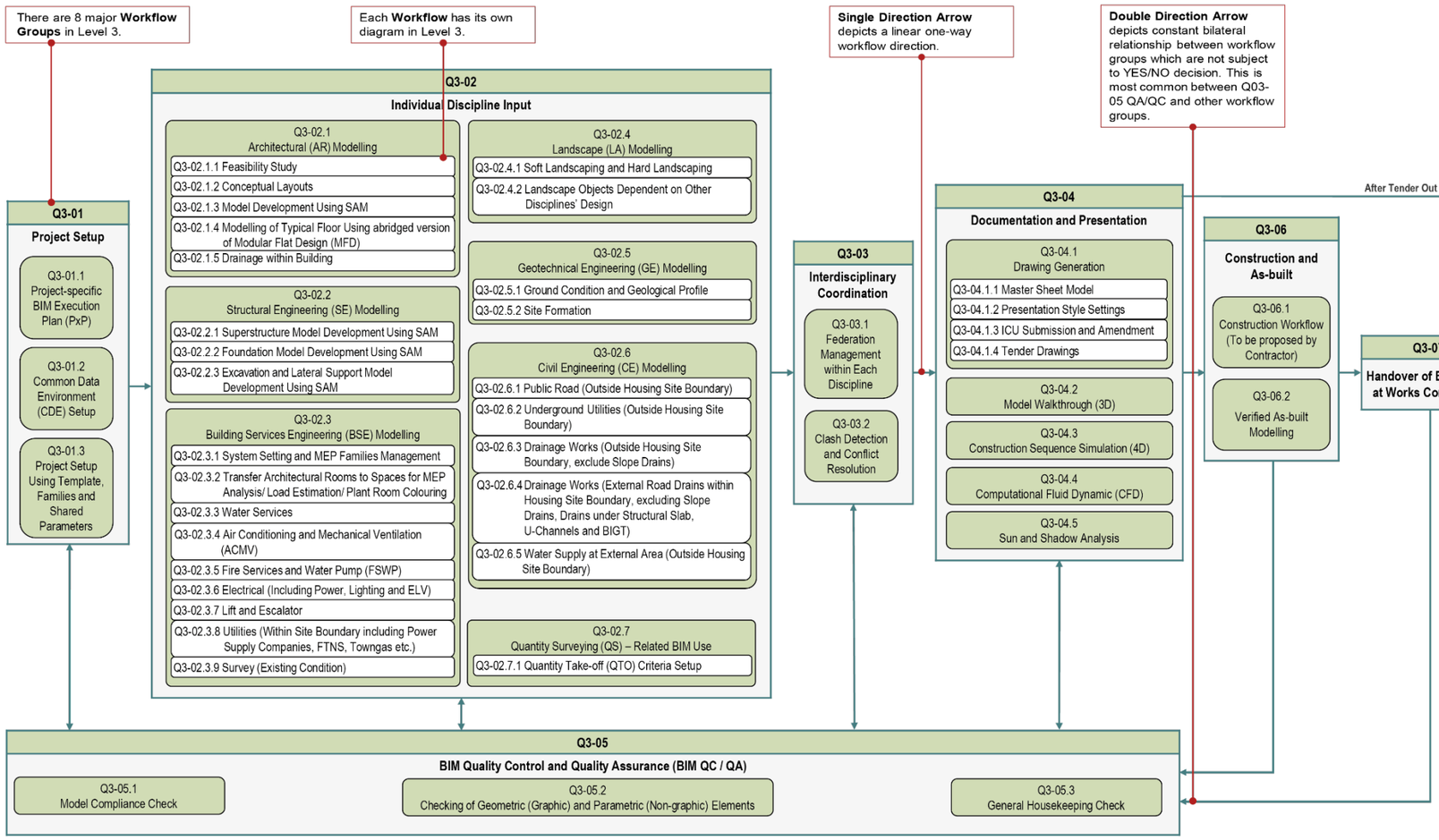


Figure 5 Overall Workflow Diagram Explained

Explained: Quick Guide Level 3 – Individual BIM Workflows

Purpose

1. To illustrate technical workflow for design authoring, namely input, process (information creation) and output.
2. To map each workflow step to Level 4 for detail technical know-how instruction.

In Level 3, the relationship of the models and information are illustrated in detail, as follows:

Input

These workflows are read-only structured data to be referenced or imported into authoring models for content creation.

The structured data include templates, content libraries, BIM models by other parties, schedules, survey data and 3D models, etc.

Process

The authoring model is the container for created contents. It references or imports the input data, undergoes the steps and creates the content set.

That is, PTs / PSPs / Contractors shall author BIM models using input data as reference or background.

Output

Output from individual BIM workflows may consist of native BIM models, drawings generated from BIM, interdisciplinary and intradisciplinary coordination results, analyses relevant to project-specific BIM Uses, or quality check results. For example, when the authoring model is a sheet file, drawing sets will be output as deliverables.

Any major deviations from HABIMSG Level 3 Workflows shall be documented and explained in PxP.

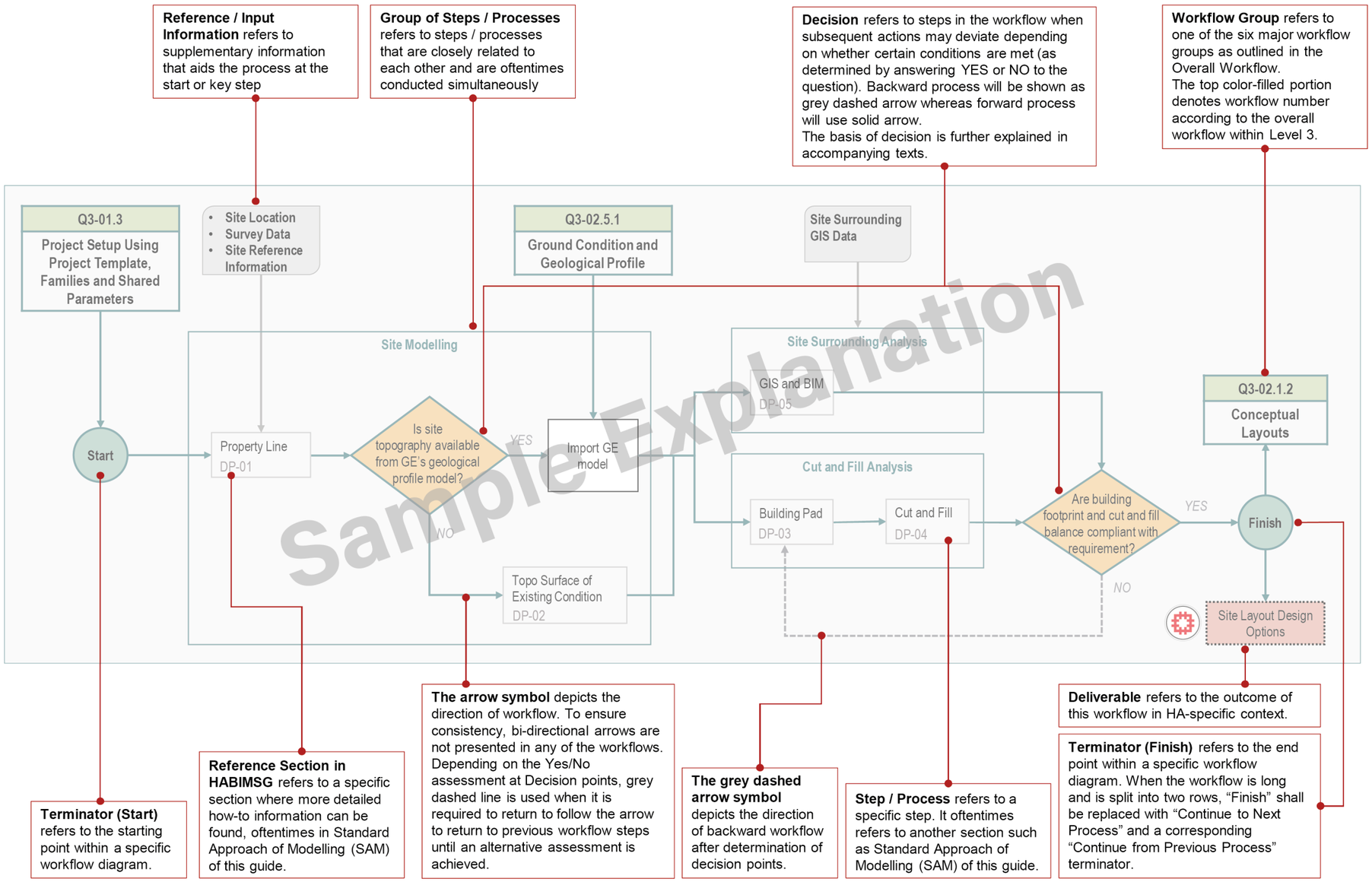


Figure 6 Individual Workflow Diagram Explained

Explained: Detail Guide Level 4

Detail Guide Level 4 includes detailed explanation on:

- Level of Development (LOD)
- BIM Collaboration
- Common Modelling Strategy
- Standard Approach of Modelling (SAM)
- Presentation Style
- BIM Quality Assurance

These sections contain several technical terms for operational uses and are intended to be **used mainly by technical staff**. At the same time, for detailed operational procedures not written in HABIMSG, users should refer to the software user manuals on the particular version in use.

From the workflow diagrams in Quick Guide Level 3, technical users shall locate the relevant Level 4 information by using the reference index in the procedure/method box.

D1. Level of Development (LOD)

The section specifies the **LOD definition, specification and responsibility matrix** adopted by HA.

The **LOD Responsibility Matrix** tables serve as templates for PTs / PSPs / Contractors to specify which LOD (LOD-G and LOD-I) is typically expected for each model element at the completion of each project stage. The pre-filled values are provided as a starting point for further adjustment by model authors and receivers as project progresses. PTs / PSPs / Contractors / BIMSPs shall review the LOD Responsibility Matrix in PxP from time to time, especially at project milestones, to ensure that LODs specified and delivered suit project needs.

D2. BIM Collaboration

The section specifies the **HA-specific collaboration procedures and standards, Common Data Environment, federated model creation, BIM coordination meetings, intra- and inter-disciplinary collaboration procedures** in principle.

D3. Common Modelling Strategy

The section layouts the **modelling best practices, HA-specific model segregation strategy, system and project setup and the HA-specific modelling process from modular flat to project** which in **apply to all disciplines** in principle.

D4. Standard Approach of Modelling (SAM)

The section is sorted by discipline, then corresponding common model elements. In principle and where applicable, each SAM follows the structure and sequence of **"I" – Information Management / Information Requirement** and **"M" – Model Authoring**

Each SAM starts with **the fundamental data structure requirements** for each model elements, including the discipline, family type, category, workset, family naming convention and type naming convention.

Table format and examples of fields to be included are shown below:

Discipline	
Family	
Category	
Workset	
Family Naming Convention	
Type Naming Convention	

	Short form	**Description**
Category		
Functional Type		
Originator		
1st_Descriptor		
2nd_Descriptor		

Information Requirement

The Information Requirement sections outline list of typical essential parameters required for each model element,

Format and examples of fields to be included are shown below:

Information Requirement

List of Built-in Parameters

Parameter name	Information	Remark	Example

List of Shared Parameter

Parameter name	Information	Discipline	Type of Parameter	Group parameter under	Type/ Instance	Example

Model Authoring

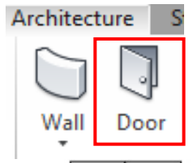
The Model Authoring section provides step-by-step guidance on modelling of graphical/geometrical representation of the model elements. Technical staff may follow the instructions on **How** to complete model authoring activities.

Sample content is shown below for reference:

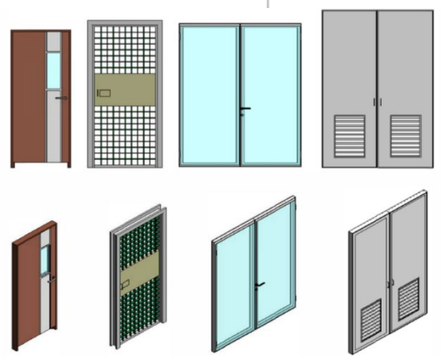
Model Authoring

A) Create doors

1. Doors are wall hosted components, place door by selecting Architecture > Door.



2. HA Door Family has the following type. Load HA standard Door Family into project. It is recommended to start with HA family and modify for project specific use.



Important Note:

Do not include details (both in terms of geometry and information) in the BIM model that serve little or no purposes.

It is important to keep the BIM model and file size as light as possible to improve hardware efficiency and minimise unnecessary workload. Concept of PURPOSE DRIVEN BIM shall be remembered.

D5. Presentation Style

The section specifies the **presentation and drawing production requirements specific to HA practice**. This includes sections on drawing sheet compilation, preparation for publication, model and drawing detail.

Particular attention shall be paid to Section D5.4 of the Level 4 Detail Guide, **drawing set-up for ICU submission** in production of General Building Plan, Foundation Plan and Superstructure Plan

D6. BIM Quality Assurance

The section consolidates the requirements on BIM Quality Assurance, specifying **roles and responsibilities for BIM Quality Assurance, level of BIM Quality Assurance and checklists** applicable to HA projects.

The section shall be read in conjunction with following sections of this Guide:

- Q3-05 BIM Quality Control and Quality Assurance (QC / QA) workflows
- Section 9 of ANN-1.1 BIM Project Execution Plan (PxP) Template
- ANN-1.2 HA BIM Quality Assurance (QA) Checklists

Explained: Annex

The Annex include the followings as supplementary resources for facilitating BIM implementation in HA:

BIM Project Execution Plan (PxP) Template provides the template for PTs / PSPs / Contractors to formulate the BIM PxP of specific HA projects.

HA BIM Quality Assurance (QA) Checklists provides technical guidance and area of concern on HA BIM Quality Assurance according to D6. BIM Quality Assurance of this Guide.

Modelling Resources list out HA directories for HA Project Model Templates, HA Family Library, HA Shared Parameter Lists, Abridged Version of Modular Flat Design (MFD) Templates.

HA BIM QTO Scope list out the modelling items in Design BIM models that shall be under the BIM QTO scope currently implemented by HA.

BIM Training Videos provide technical guidance to supplement the application of HABIMSG Vol.2.

I.T. Setup Recommendation outlines recommended hardware, operating system, software and network setup.

List of Codes & Abbreviations

Refer to Level 4 Section D.3.3, D.MET-3.2 Naming Conventions for a list of HA-specific codes and abbreviations.

1.3a 2.4 Starting a BIM Project

A. Points to note

The followings are essential when adopting BIM in projects from the **Management** perspective:

- Appoint **Discipline Coordinator** for every project.
- Put in place the **BIM Project Execution Plan (PxP)** that identifies key project tasks (BIM Uses), output and model configuration, etc.
- Agree on and conduct **BIM Project reviews regularly** to ensure model integrity and project workflow is maintained.
- Develop clear guidelines for **internal and external collaboration** which maintain the integrity of project information.
- Identify **clear ownership of model elements** through the life of the project.
- **Do not over-model.** Understand and clearly document what is to be modelled and to what level of development.
- **Sub-divide models** between **disciplines**, and,
- Within each individual discipline to avoid any single model file size getting over **500MB**.
- Adopt efficient and minimum detailing, and eliminate detail repetition.
- **Maintain the integrity of the model** by always pay attention to both the **3D geometry** and **information**. E.g. Carry out all changes to the model as 3D modifications, rather than 2D 'patches'.
- Model authors shall refer to **the modelling and information requirements listed in relevant SAM sections of HABIMSG (D4 of HABIMSG Vol.2)** when Revit families shall be created for fulfilling any modelling needs.

For summary of recommended modelling maintenance and modelling best practices in **Technical** aspect, refer to Volume 2 – Detail Guide Level 4 Section D3. Common Modelling Strategy.

A fundamental principle of the HABIMSG is that the architects, engineers and others involved in a project can use BIM to produce consistent and high-quality drawings for Statutory submission or tendering purposes. Traditional drawing conventions still apply to drawings that are produced using BIM:

- A drawing shall contain design information solely for the purpose of the intended use of the drawing.
- To maximise efficiency, a policy of minimum detailing without compromising quality and integrity shall be adopted.
- Numbers of drawings shall be kept to the absolute minimum and organised in a logical manner.
- Avoidance of view duplication is essential to ensure drawings maintain their integrity as the interactive design process progresses and amendments are made.

B. Preparation of BIM Project Execution Plan (PxP)

When starting a project adopting BIM, **design team** shall prepare the **Design Stage BIM PxP** and **Contractor / construction team** shall prepare the **Construction Stage BIM PxP**. **BIM Manager** shall:

1. Obtain and start with a fresh copy of HA BIM Project Execution Plan (PxP) Template from **ANN-1.1** of HABIMSG Annex. (For Contractor to prepare the Construction Stage BIM PxP, the Contractor shall also obtain the Design Stage BIM PxP as reference, if applicable.)
2. Identify **BIM Uses** to be adopted for the project by going through Quick Guide Level 1 to 3 as illustrated in the flowchart, which means in principle:
   a Go through Quick Guide Level 1 - BIM Use Overview to identify and understand the BIM Uses adopted for the responsible party during particular work stages.
   b With Quick Guide Level 2 - BIM Application Detail, **assess the involved effort**, involved parties and BIM models to be developed against the team's available time and resources.
   c Together with project technical officers, go through Quick Guide Level 3 for detail **BIM workflows** applicable in fulfilling the BIM Uses adopted in the project.
3. Call for **BIM kick off meeting** with involved disciplines.
4. In meeting, all disciplines to make joint decision on overall BIM execution for the project.
5. Based on conclusion made in the meeting, the BIM Manager shall fill out the **BIM PxP** with information specific to the project.

C. Gathering available HA BIM resources

During each project commencement, Project Teams / BIMSPs / PSPs / Contractors shall gather the HA specific supplementary BIM resources from the project Senior Technical Officer (STO), as listed in **ANN-1** of HABIMSG Annex to facilitate Project Teams / BIMSPs / PSPs / Contractors to adopt BIM more efficiently.

HA BIM Resources include:
1. HA BIM Standards and Guidelines
2. HA BIM Project Execution Plan (PxP) Template
3. HA BIM Quality Assurance (QA) Checklists
4. HA Project Model Templates
5. HA Family Library
6. HA Shared Parameter Lists
7. Abridged Version of Modular Flat Design (MFD) Models
8. BIM Training Videos
9. Projects' Design BIM Model, if available (to be obtained from PT)

PTs / PSPs / BIMSPs / Contractors should develop the BIM models and BIM objects based on the modelling resources as listed in **ANN-1.3**.of HABIMSG Annex.

Note that, however, provision of these resources shall not release the responsibility by the Project Teams / BIMSPs / PSPs / Contractors in maintaining accuracy and integrity of the models, drawings generated from the models and other applicable deliverables It is hereby stressed that users have the ultimate responsibility over the work they produced and should ensure that it meets project requirements. The use of these resources shall not relieve the users from such liabilities or obligations and HA accepts no responsibilities in this regards.

Volume 1 of 2 -
Introduction and Quick Guide

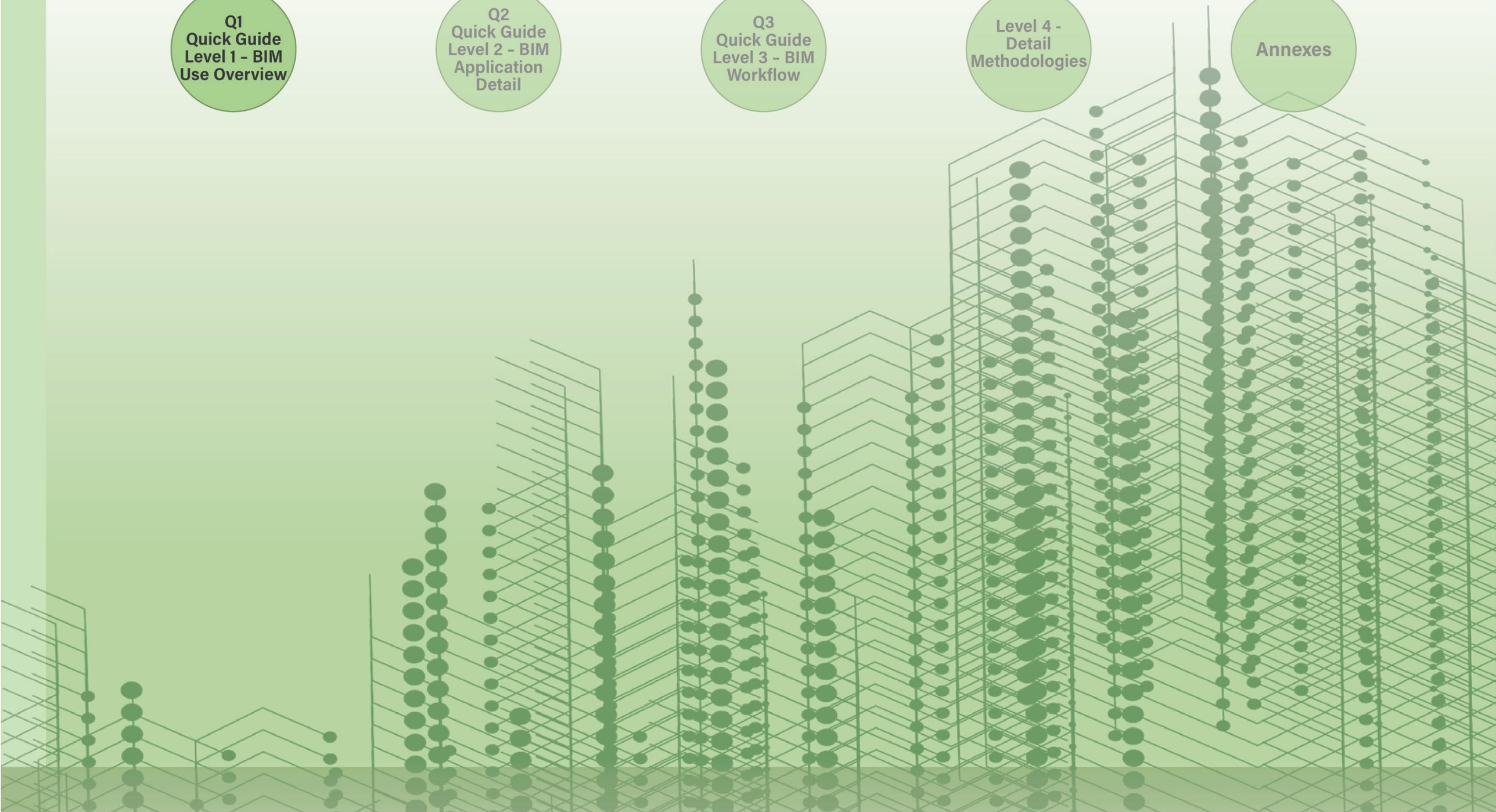
- **Q1** Quick Guide Level 1 – BIM Use Overview
- **Q2** Quick Guide Level 2 – BIM Application Detail
- **Q3** Quick Guide Level 3 – BIM Workflow

Volume 2 of 2 –
Detail Guide

- Level 4 - Detail Methodologies

Annex

- Annexes



Q1 Quick Guide Level 1 – BIM Use Overview

BIM Use Definition and Adoption

BIM Use by Work Stages in HA are defined in the table below for Inception and Feasibility Stage, Design Stage and Construction Stage. PTs / PSPs / Contractors / BIMSPs are to implement BIM Uses to their project accordingly.

Note that for exact BIM Uses definition and adoption on projects

1) For HA Works, please also refer to relevant clauses in project-specific PSP, BIMSP and Works Contracts / Agreement.
2) For Government Entrusted Works, please refer to DevB Techincal Circular (Works) No. 12/2020 or subsequent revisions.

In case of discrepancies found between the definitions of the BIM uses listed in the table below of this HABIMSG and relevant clauses in the project specific PSP, BIMSP and Works Contracts/ Agreement, the definitions of the BIM Uses in the PSP, BIMSP and Works Contracts/ Agreement shall be referred.

PTs / PSPs / Contractors / BIMSPs shall include this table in the BIM PxP.

BIM Uses (With reference to DEVB BIM Uses - Technical Circular (Works) No. 12/2020)		**Responsible Party***	**BIM Use Definition and Adoption by Work Stages in HA**											
			Inception & Feasibility Stage		**Design** stage							**Construction** Stage		
			DevB T/C (Works) 12/2020	**Inception & Feasibility (IF)**	DevB T/C (Works) 12/2020	**Schematic Design (SD)**		**Detailed Design (DD)**			**Tender (TE)**	DevB T/C (Works) 12/2020	**Construction (CS)**	**Completion** (As-Built (AB))
						Pre BC		Post BC						
						PDRC 2	BC	ICU (GBP)	ICU (PIL)	DDRP	TC			
1	**Design Authoring**	Designer	M	To use BIM authoring software to create and develop the design and to support other BIM Uses.	M	To use BIM authoring software to create and develop the design and to support other BIM Uses.						M	To use BIM authoring software to create and develop the design and to support other BIM Uses.	
				M		M	M	M	M	M	M		M	
		Contractor	M		M							M	To use BIM authoring software to create and develop the items where the design responsibility is borne by the Contractor and to support other BIM Uses.	
													M	
2	**Design Reviews**	Designer	M	To use BIM for stakeholders to view a model, images and drawings from the models or animated walkthroughs of the project, provide feedback and validate numerous design aspects, such as meeting the project requirements and previewing spaces and layouts in digital deliverables, as far as practicable.	M	To use BIM for stakeholders to view a model, images and drawings from the models or animated walkthroughs of the project, provide feedback and validate numerous design aspects, such as meeting the project requirements and previewing spaces and layouts in digital deliverables, as far as practicable.						M	To use BIM for stakeholders to view a model, images and drawings from the models or animated walkthroughs of the project, provide feedback and validate numerous design aspects, such as meeting the project requirements and previewing spaces and layouts in digital deliverables, as far as practicable.	
				M		M	M	M	M	M	M		M	
		Contractor	M		M							M	To use BIM for design review.	
													M	

Note:

***Responsible Party:**

Designer	Definitions and Adoption applicable to BIMSP and In-house A, SE, BSE teams or ASP, ESP, BSESP
Contractor	Definitions and Adoption applicable to Foundation and Building Contractor

BIM Use Adoption:

M	Mandatory BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
O	Optional BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
M	Mandatory BIM uses for HA Works. For detail requirements, please refer to the table listed at Level 1 of this Guide and the ASP, ESP, BSESP, BIMSP and Works (Foundation and Building) Contracts / Agreements
	Grey box indicates that the BIM Use is **not applicable** to the particular work stage and responsible party

BIM Uses (With reference to DEVB BIM Uses - Technical Circular (Works) No. 12/2020)		Responsible Party*	BIM Use Definition and Adoption by Work Stages in HA											
			Inception & Feasibility Stage		**Design** stage							**Construction** Stage		
			DevB T/C (Works) 12/2020	**Inception & Feasibility (IF)**	DevB T/C (Works) 12/2020	**Schematic Design (SD)**		**Detailed Design (DD)**			**Tender (TE)**	DevB T/C (Works) 12/2020	**Construction (CS)**	**Completion** (As-Built (AB))
						Pre BC		Post BC						
						PDRC 2	BC	ICU (GBP)	ICU (PIL)	DDRP	TC			
3	**Existing Conditions Modelling**	Designer	M	*(Applicable to Architectural Sections and ASP only)* To create a BIM model of the existing site conditions within the project boundary and surrounding area within a 50m radius. *(Applicable to SE Sections and ESP only)* To create a BIM model of the existing site conditions and the underground geological profiles (including surrounding area within 50m radius).	M	*(Applicable to Architectural Sections and ASP only)* To create a BIM model of the existing site conditions within the project boundary and surrounding area within a 50m radius. *(Applicable to SE Sections and ESP only)* To create a BIM model of the existing site conditions and the underground geological profiles (including surrounding area within 50m radius).						M	*(Applicable to Architectural Sections and ASP only)* To create a BIM model of the existing site conditions within the project boundary and surrounding area within a 50m radius. *(Applicable to SE Sections and ESP only)* To create a BIM model of the existing site conditions and the underground geological profiles (including surrounding area within 50m radius).
				M		M	M	M	M	M	M			M
		Contractor											To create a 3D model of the existing site conditions (including surrounding area within 50m radius) for facilitating construction planning.	
														M
4	**Site Analysis**	Designer	M	*(Applicable to Architectural Sections only)* To use BIM and/or Geographic Information System (GIS) tools to evaluate the site and determine the most optimal location, position, orientation, road alignment, etc. for the project.	M	*(Applicable to Architectural Sections and ASP only)* To use BIM and/or Geographic Information System (GIS) tools to evaluate the site and determine the most optimal location, position, orientation, road alignment, etc. for the project.						-		
				M		M	M							
5	**3D Coordination**	Designer	-		M	To use BIM for design coordination, identifying and eliminating clashes, errors and conflicts.						M	To use BIM for design coordination, identifying and eliminating clashes, errors and conflicts.	
						M	M	M	M	M	M		M	
		Contractor											To use BIM model in conducting design coordination process including but not limited to identifying design clashes and eliminating design errors and conflicts before construction.	
													M	
6	**Cost Estimation**	Designer	O	*(Not used currently in HA Works)*	M	To facilitate PQS to use BIM for cost estimation and quantity take-off. (Note: PSP and in-house Architectural, Structural and Building Services Sections shall devise and create the BIM model to enable quantity take-off on foundation and certain designated trades in building for the preparation of Bills of Quantities and other tender documents by the PQS. For detail requirements, please refer to Annex ANN-1.4 of this Guide.)						M	*(Not used currently in HA Works)*	
										M	M			
		Contractor											To use BIM model for cost evaluation on variation works as far as practicable.	
													M	
7	**Engineering Analysis**	Designer	-		M	To use the BIM model to assist in various engineering analyses, such as, structural, ventilation, lighting, energy, fire, civil and others, as far as practicable.						M	To use the BIM model to assist in various engineering analyses, such as, structural, ventilation, lighting, energy, fire, civil and others, as far as practicable.	
										M	M		M	

Note:

***Responsible Party:**

Designer	Definitions and Adoption applicable to BIMSP and In-house A, SE, BSE teams or ASP, ESP, BSESP
Contractor	Definitions and Adoption applicable to Foundation and Building Contractor

BIM Use Adoption:

M	Mandatory BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
O	Optional BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
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BIM Uses (With reference to DEVB BIM Uses - Technical Circular (Works) No. 12/2020)		Responsible Party*	BIM Use Definition and Adoption by Work Stages in HA											
			Inception & Feasibility Stage		**Design** stage							**Construction** Stage		
			DevB T/C (Works) 12/2020	**Inception & Feasibility (IF)**	DevB T/C (Works) 12/2020	**Schematic Design (SD)**		**Detailed Design (DD)**			**Tender (TE)**	DevB T/C (Works) 12/2020	**Construction (CS)**	**Completion** (As-Built (AB))
						Pre BC		Post BC						
						PDRC 2	BC	ICU (GBP)	ICU (PIL)	DDRP	TC			
8	**Facility Energy Analysis**	Designer	-		O	*(Not used currently in HA Works)*						O		
		Contractor											*(Not used currently in HA Works)*	
9	**Sustainability Evaluation**	Designer	O	*(Not used currently in HA Works)*	M	To comply with the requirements of BEAM Plus New Buildings Version 2.0 IDCM 16 (a).				M	M	M	To comply with the requirements of BEAM Plus New Buildings Version 2.0 IDCM 16 (b).	
													M	
		Contractor											To fulfill BEAM Plus New Buildings Version 2.0 IDCM 16 (b) BIM Integration - Coordinated Use of BIM within Design and Construction Teams requirements.	
													M	
10	**Space Programming**	Designer	O	*(Not used currently in HA Works)*	M	*(Applicable to Architectural Sections and ASP only)* To use BIM for checking spatial requirements and/or statutory compliance such as schedule of accommodations, plot ratio, site coverage, green coverage etc., as far as practicable.						-	*(Applicable to Architectural Sections and ASP only)* To use BIM for checking spatial requirements and/or statutory compliance such as schedule of accommodations, plot ratio, site coverage, green coverage etc., as far as practicable.	
						M	M	M	M	M	M		M	
11	**Phase Planning (4D Modelling)**	Designer	-		M	To utilise an interactive 4D model (3D models with the added dimension of time) for Phase Planning, and to visually demonstrate and communicate project construction sequence based on proposed design and requirements on the project, as far as practicable.						M	To utilise an interactive 4D model (3D models with the added dimension of time) for Phase Planning, and to visually demonstrate and communicate project construction sequence based on proposed design and requirements on the project, as far as practicable.	
										M	M		M	
		Contractor											To make use of BIM model created for the animated 4D video submitted at tender stage and update the BIM model to reflect actual construction progress every 4 months. The Contractor is required to make use of BIM and link the activities in the up-to-date programme to conduct 4D model simulation.	
													M	
12	**Digital Fabrication**	Designer	-		M	To digitalise and illustrate critical / complex construction details in BIM as far as practicable on components of large quantities or off-site prefabrication.						M	To digitalise and illustrate critical / complex construction details in BIM as far as practicable on components of large quantities or off-site prefabrication.	
										M	M		M	
		Contractor											*(Applicable to building contracts and combined building and foundation contracts only)* To use digitized information in BIM to facilitate the fabrication of construction materials or assemblies.	
													M	

Note:

***Responsible Party:**

Designer	Definitions and Adoption applicable to BIMSP and In-house A, SE, BSE teams or ASP, ESP, BSESP
Contractor	Definitions and Adoption applicable to Foundation and Building Contractor

BIM Use Adoption:

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BIM Uses (With reference to DEVB BIM Uses - Technical Circular (Works) No. 12/2020)		Responsible Party*	BIM Use Definition and Adoption by Work Stages in HA											
			Inception & Feasibility Stage		**Design** stage							**Construction** Stage		
			DevB T/C (Works) 12/2020	**Inception & Feasibility (IF)**	DevB T/C (Works) 12/2020	**Schematic Design (SD)**		**Detailed Design (DD)**			**Tender (TE)**	DevB T/C (Works) 12/2020	**Construction (CS)**	**Completion** (As-Built (AB))
						Pre BC		Post BC						
						PDRC 2	BC	ICU (GBP)	ICU (PIL)	DDRP	TC			
13	**Site Utilization Planning**	Contractor	-		-							M	To use BIM models for site layout planning including reviewing space planning, site logistics, sequencing requirements, temporary works and site safety. To utilize BIM for generating the site layout plan. M	
14	**3D Control and Planning**	Contractor	-		-							M	*(Applicable to building contracts and combined building and foundation contracts only)* To ensure work carried out on site is accurately positioned through the use of Global Positioning System (GPS) devices and verify control points generated from the BIM model. M	
15	**As-built Modelling**	Contractor	-		-							M	To handover a full set of as-built models (excluding asset management data) reflecting actual physical conditions of the Works with Level of Development (LOD) in accordance with HABIMSG – LOD Responsibility Matrix within 30 calendar days from the date of completion certified by the CM. *(Applicable to foundation contracts only)* The as-built models shall contain as-built piling records/schedules which shall include but not limited to the duration of each construction activity, concrete/grout casting dates and volumes of concrete/grout for each piles/footing etc. *(Applicable to building contracts and combined building and foundation contracts only)* The as-built models shall contain as-built records/schedules which shall include but not limited to the duration of each construction activity, concrete casting dates and volumes of concrete for each footing (if any) etc.. M	
16	**Project Systems Analysis**	Contractor	-		-							O	*(Not used currently in HA Works)*	
17	**Maintenance Scheduling**	Contractor / FM-AM Manager	-		-							M	*(Not used currently in HA Works)*	
18	**Space Management and Tracking**	Contractor / FM-AM Manager	-		-							O	*(Not used currently in HA Works)*	
19	**Asset Management**	Contractor / FM-AM Manager	-		-							M	*(Not used currently in HA Works)*	

Note:

***Responsible Party:**

Designer	Definitions and Adoption applicable to BIMSP and In-house A, SE, BSE teams or ASP, ESP, BSESP
Contractor	Definitions and Adoption applicable to Foundation and Building Contractor

BIM Use Adoption:

M	Mandatory BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
O	Optional BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
M	Mandatory BIM uses for HA Works. For detail requirements, please refer to the table listed at Level 1 of this Guide and the ASP, ESP, BSESP, BIMSP and Works (Foundation and Building) Contracts / Agreements
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BIM Uses (With reference to DEVB BIM Uses - Technical Circular (Works) No. 12/2020)		Responsible Party*	BIM Use Definition and Adoption by Work Stages in HA											
			Inception & Feasibility Stage		**Design** stage							**Construction** Stage		
			DevB T/C (Works) 12/2020	**Inception & Feasibility (IF)**	DevB T/C (Works) 12/2020	**Schematic Design (SD)**		**Detailed Design (DD)**			**Tender (TE)**	DevB T/C (Works) 12/2020	**Construction (CS)**	**Completion** (As-Built (AB))
						Pre BC		Post BC						
						PDRC 2	BC	ICU (GBP)	ICU (PIL)	DDRP	TC			
20	**Drawing Generation (Drawing Production)**	Designer	-		M	To use BIM for generating drawings for design, statutory submission and tender unless justified that it is technically impracticable. *(Applicable to Architectural Sections and ASP only)* To generate all drawings of scale 1:25 or above (in A1 size) from BIM models unless it is justified technically impracticable. *(Applicable to SE Sections and ESP only)* To generate all structural framing plans and other key layout plans of scale 1:100 or above (in A1 size) and all sections of scale 1:50 or above (in A1 size) from BIM models unless it is justified technically impracticable. *(Applicable to BSE Sections and BSESP only)* To generate all drawings of scale 1:100 or above (in A1 size) from BIM models unless it is justified technically impracticable.						M	To use BIM for generating drawings for design, statutory submission and tender unless justified that it is technically impracticable. (Applicable to Architectural Sections and ASP only) To generate all drawings of scale 1:25 or above (in A1 size) from BIM models unless it is justified technically impracticable. (Applicable to SE Sections and ESP only) To generate all structural framing plans and other key layout plans of scale 1:100 or above (in A1 size) and all sections of scale 1:50 or above (in A1 size) from BIM models unless it is justified technically impracticable. (Applicable to BSE Sections and BSESP only) To generate all drawings of scale 1:100 or above (in A1 size) from BIM models unless it is justified technically impracticable.	
						M	M	M	M	M	M		M	
		Contractor											*(Applicable to foundation contracts only)* To utilize BIM for generating 2D as-built foundation drawings. *(Applicable to building contracts and combined building and foundation contracts only)* To use BIM for generating drawings including but not limited to Combined Services Drawings (CSD), Combined Builder's Works Drawings (CBWD), construction and as-built drawings as far as practicable.	
													M	

Note:

***Responsible Party:**

Designer	Definitions and Adoption applicable to BIMSP and In-house A, SE, BSE teams or ASP, ESP, BSESP
Contractor	Definitions and Adoption applicable to Foundation and Building Contractor

BIM Use Adoption:

M	Mandatory BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
O	Optional BIM uses for Government Entrusted Works. For detail requirements, please refer to DevB Technical Circular (Works) No. 12/2020 or subsequent revisions
M	Mandatory BIM uses for HA Works. For detail requirements, please refer to the table listed at Level 1 of this Guide and the ASP, ESP, BSESP, BIMSP and Works (Foundation and Building) Contracts / Agreements
	Grey box indicates that the BIM Use is **not applicable** to the particular work stage and responsible party

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Annex

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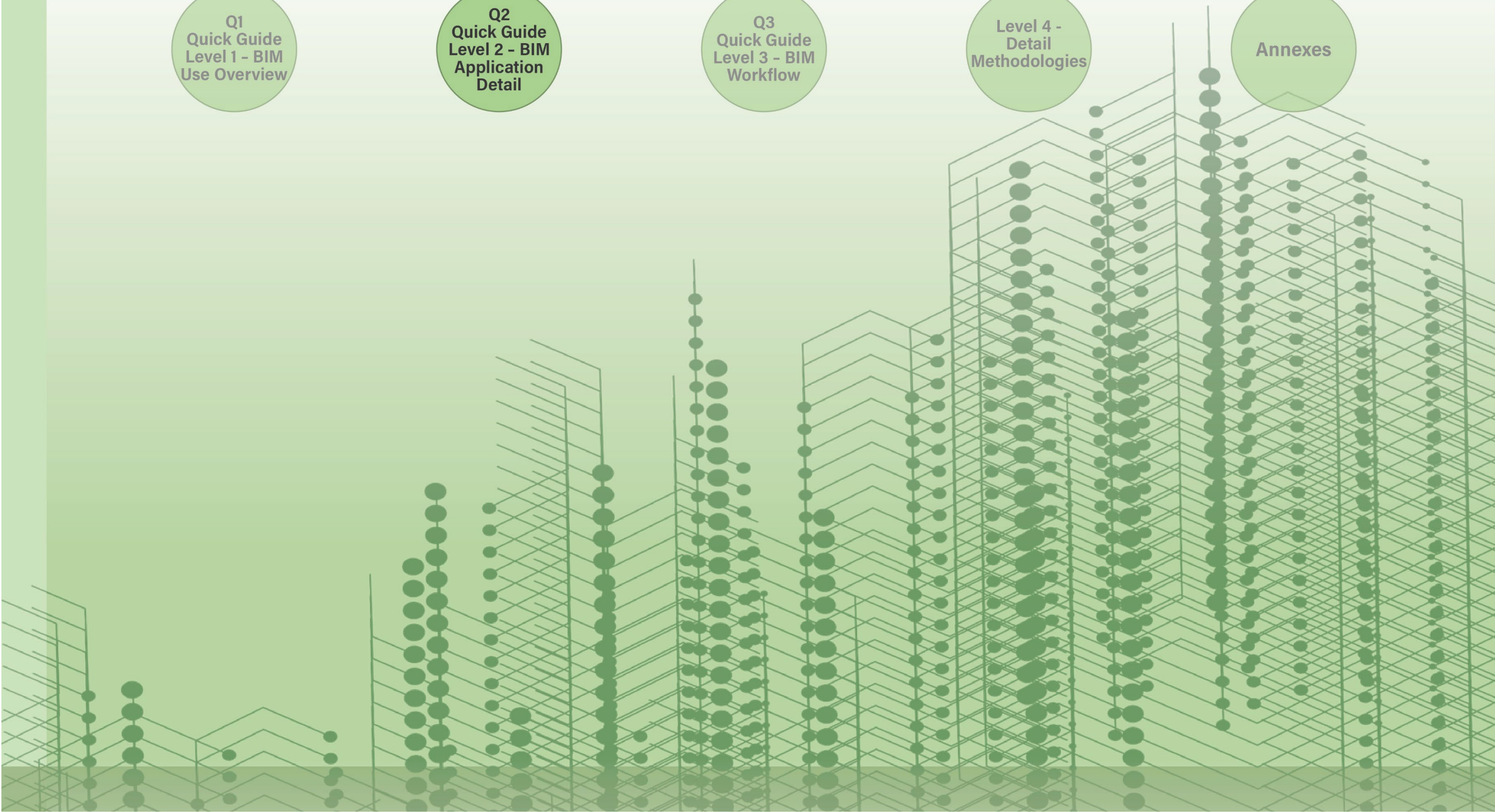

Q2 Quick Guide Level 2 – BIM Application Detail

Q2 Quick Guide Level 2 – BIM Application Detail provides examples for BIM application and corresponding tasks and serves as recommended best practices only, i.e., they shall not be deemed as mandatory requirements nor be exhaustive. For Mandatory BIM uses, please refer to relevant clauses in project-specific PSP, BIMSP and Works Contracts / Agreement.

PTs / PSPs / Contractors / BIMSPs shall include this table in the BIM PxP, modify to suit project-specific adoption of the BIM application and task examples.

Legend

Project Stage & Milestone: **IF** – Inception & Feasibility **SD** – Schematic Design **DD** – Detailed Design **TE** – Tender **CS** – Construction **AB** – As-Built

Relative Effort: In scale of 1 to 10, with 10 being the most intensive effort required. The numbers represent relative levels rather than man days

1	**Design Authoring**													
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)											
			IF		SD		DD		TE		CS		AB	
1.1	Architectural													
1.1.1	Development Parameters	· Conceptual mass	√		N/A		N/A		N/A		N/A		N/A	
		· Plot Ratio calculation	√		√		√		N/A		N/A		N/A	
		· Building height study	√	(2)	√	(3)	√	(3)	N/A		N/A		N/A	
		· Flat mix & efficiency	√		√		√		N/A		N/A		N/A	
		· Green coverage	√		√		√		N/A		N/A		N/A	
1.1.2	Typical Floors	· Make use of the abridged version of Modular Flat Design model to create block layout	√		√		√		N/A		N/A		N/A	
		· Project team to make adjustment to MFD if required	√		√		√		N/A		N/A		N/A	
		· Design of non-standard layout (corridor, lobby, plant room, etc.)	√	(3)	√	(4)	√	(5)	√	(6)	N/A	(6)	N/A	
		· Plans, sections & elevations (modular flat and other non-standard elements)	N/A		√		√		√		√		N/A	
1.1.3	Remaining Area (Podium, external areas, roof, footbridges & covered walkway, etc.)	· Design of non-standard layout (corridor, lobby, plant room, etc.)	√		√		√		√		N/A		N/A	
		· Plans, sections & elevations (all applicable elements)	N/A	(4)	√	(5)	√	(6)	√	(7)	√	(7)	N/A	
		· Exterior tile / cladding layout	N/A		N/A		√		√		√		N/A	
1.1.4	Modular Flat Assembly	· Flat size and provision options	√		√		√		N/A		N/A		N/A	
		· Plans, sections & elevations (all applicable elements)	√	(3)	√	(4)	√	(5)	√	(6)	√	(6)	N/A	
		· Toilets and kitchen layout	√		√		√		√		√		N/A	
1.1.5	Interior	· Plans and internal elevations	N/A		√		√		√		√		N/A	
		· Detailed design of domestic lobbies, etc.	N/A		N/A	(4)	√	(5)	√	(6)	√	(6)	N/A	
		· Interior fitment schedules	N/A		N/A		N/A		√		√		N/A	
1.1.6	Design BIM Model during Construction stage (By Designer)	· (By designer) continuously update applicable design BIM models, drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√	(5)	N/A	(2)
		· (By designer) finalised Design BIM Model	N/A		N/A		N/A		N/A		√		√	
1.2	Civil Engineering													
1.2.1	Infrastructure	· Roads & bridges layout plan and 3D	N/A		√	(3)	√	(4)	√	(5)	√	(4)	N/A	
		· Designer to continuously update drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√		N/A	
1.2.2	Drainage at External Area	· Interface location with drainage within building	N/A		√		√		√		N/A		N/A	
		· Drainage layout plan and routing	N/A		√		√		N/A		N/A		N/A	
		· Drainage layout plan and routing in 3D	N/A		N/A	(4)	√	(7)	√	(8)	√	(10)	N/A	
		· Manhole and other pit schedules	N/A		N/A		√		√		√		N/A	
		· Developed level diagram	N/A		√		√		√		√		N/A	
1.2.3	Design BIM Model during Construction stage (By Designer)	· (By designer) continuously update applicable design BIM models, drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√	(4)	N/A	(2)
		· (By designer) finalised Design BIM Model	N/A		N/A		N/A		N/A		√		√	

1	**Design Authoring**																						
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)																				
			IF		SD		DD		TE		CS		AB										
1.3	Geotechnical Engineering																						
1.3.1	Site Formation	· Estimation of volume of soil cut/fill, rock excavation	√	(2)	√	(3)	√	(4)	N/A	(5)	N/A	(4)	N/A										
		· Cut & fill balancing, natural terrain hazards	√		√		N/A		N/A		N/A		N/A										
		· Ground investigation (refer item 3.1.2)	√		√		√		√		N/A		N/A										
		· Site formation plan and section	N/A		√		√		√		N/A		N/A										
		· Slope and retaining wall design	N/A		√		√		√		√		N/A										
		· Site formation slope and retaining wall site works	N/A		N/A		√		N/A		√		N/A										
1.3.2	Design BIM Model during Construction stage (By Designer)	· (By designer) continuously update applicable design BIM models, drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√	(3)	N/A	(2)									
		· (By designer) finalised Design BIM Model	N/A		N/A		N/A		N/A		√		√										
1.4	Structural Engineering																						
1.4.1	Foundation	· Structural analysis for foundation design	N/A	(2)	√	(3)	√	(4)	√	(5)	√	(4)	N/A										
		· Foundation plan, sections and schedules	N/A		√		√		√		√		N/A										
		· (BIM-SAFD) BIM-enabled Systematic Approach to Foundation Design	N/A		√		√		√		√		N/A										
1.4.2	Excavation and Lateral Support (ELS) Works	· ELS design, plans, sections and schedules	N/A	(3)	√	(4)	√	(5)	√	(4)	√	(4)	N/A										
		· ELS design phasing and sequencing including left-in lateral shoring, waling and kingpost, etc.	N/A		√		√		√		√		N/A										
1.4.3	Superstructure	· Structural analysis for superstructure design	N/A	(2)	√	(3)	√	(4)	√	(5)	√	(5)	N/A										
		· Superstructure framing plans, sections and schedules	N/A		√		√		√		√		N/A										
1.4.4	Demolition	· Demolition design, plans and sections	N/A	(2)	√	(3)	√	(3)	√	(3)	√	(1)	N/A										
		· Demolition phasing and sequencing	N/A		√		√		√		√		N/A										
1.4.5	Design BIM Model during Construction stage (By Designer)	· (By designer) continuously update applicable design BIM models, drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√	(4)	N/A	(2)									
		· (By designer) finalised Design BIM Model	N/A		N/A		N/A		N/A		√		√										
1.5	Building Services Engineering																						
1.5.1	Aboveground & Building Services Design Brief	· Services preliminary provision (incorporate into BIM model if applicable)	√	(1)	N/A		N/A		N/A		N/A		N/A										
		· Plant rooms spatial requirement (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A										
1.5.2	ACMV	· Services preliminary provision (incorporate into BIM model if applicable)	√	(1)	N/A	(4)	N/A	(7)	N/A	(8)	N/A	(10)	N/A										
		· Plant rooms spatial requirement (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A										
		· Plant room size & location	N/A		√		N/A		N/A		N/A		N/A										
		· Major routing design	N/A		√		N/A		N/A		N/A		N/A										
		· Detail routing design	N/A		N/A		√		N/A		N/A		N/A										
		· Routing layout in 3D	N/A		N/A		N/A		√		N/A		N/A										
		· Equipment & accessory layout and schedules	N/A		N/A		√		√		√		N/A										
		· Plant room design and layout drawings	N/A		N/A		√		√		√		N/A										
		· Elevation layout for wall mounted installations	N/A		N/A		√		√		√		N/A										
		· CSD & CBWD coordination	N/A		N/A		N/A		N/A		√		N/A										
1.5.3	Electrical	· Services preliminary provision (incorporate into BIM model if applicable)	√	(1)	N/A	(4)	N/A	(7)	N/A	(8)	N/A	(10)	N/A										
		· Plant rooms spatial requirement (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A										
		· Plant room size & location	N/A		√		N/A		N/A		N/A		N/A										
		· Major routing design	N/A		√		N/A		N/A		N/A		N/A										
		· Detail routing design	N/A		N/A		√		N/A		N/A		N/A										
		· Routing layout in 3D	N/A		N/A		N/A		√		N/A		N/A										
		· Equipment & accessory layout and schedules	N/A		N/A		√		√		√		N/A										
		· Plant room design and layout drawings	N/A		N/A		√		√		√		N/A										
		· Elevation layout for wall mounted installations	N/A		N/A		√		√		√		N/A										
		· CSD & CBWD coordination	N/A		N/A		N/A		N/A		√		N/A										

1	**Design Authoring**																							
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)																					
			IF		SD		DD		TE		CS		AB	
1.5.4	Water Services	· Services preliminary provision (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A	
		· Plant rooms spatial requirement (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A	
		· Plant room size & location	N/A		√		N/A		N/A		N/A		N/A	
		· Interfacing with public mains	N/A		√		√		√		N/A		N/A	
		· Major routing design	N/A		√		N/A		N/A		N/A		N/A	
		· Detail routing design	N/A	(1)	N/A	(4)	√	(7)	N/A	(8)	N/A	(10)	N/A	
		· Routing layout in 3D	N/A		N/A		N/A		√		N/A		N/A	
		· Equipment & accessory layout and schedules	N/A		N/A		√		√		√		N/A	
		· Plant room design and layout drawings	N/A		N/A		√		√		√		N/A	
		· Elevation layout for wall mounted installations	N/A		N/A		√		√		√		N/A	
		· On-site coordination and design verification (managed by Project Architect), and continuous drawing update	N/A		N/A		N/A		N/A		√		N/A	
		· CSD & CBWD coordination	N/A		N/A		N/A		N/A		√		N/A	
1.5.5	Fire Services	· Services preliminary provision (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A	
		· Plant rooms spatial requirement (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A	
		· Plant room size & location	N/A		√		N/A		N/A		N/A		N/A	
		· Major routing design	N/A		√		N/A		N/A		N/A		N/A	
		· Detail routing design	N/A		N/A		√		N/A		N/A		N/A	
		· Routing layout in 3D	N/A	(1)	N/A	(4)	N/A	(7)	√	(8)	N/A	(10)	N/A	
		· Equipment & accessory layout and schedules	N/A		N/A		√		√		√		N/A	
		· Plant room design and layout drawings	N/A		N/A		√		√		√		N/A	
		· Elevation layout for wall mounted installations	N/A		N/A		√		√		√		N/A	
		· On-site coordination and design verification, and continuous drawing update	N/A		N/A		N/A		N/A		√		N/A	
		· CSD & CBWD coordination	N/A		N/A		N/A		N/A		√		N/A	
1.5.6	Town Gas	· Services preliminary provision (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A	
		· Interfacing with public mains	N/A		√		√		√		N/A		N/A	
		· Riser sizes	N/A		N/A		√		N/A		N/A		N/A	
		· Riser arrangement	N/A	(1)	N/A	(3)	N/A	(7)	√	(7)	√	(8)	N/A	
		· Equipment layout and schedules	N/A		N/A		√		√		√		N/A	
		· On-site coordination and design verification, and continuous drawing update	N/A		N/A		N/A		N/A		√		N/A	
		· CSD & CBWD coordination	N/A		N/A		N/A		N/A		√		N/A	
1.5.7	Miscellaneous	· Services preliminary provision (incorporate into BIM model if applicable)	√		N/A		N/A		N/A		N/A		N/A	
		· Security, CCTV layout	N/A	(1)	√	(3)	√	(6)	√	(7)	√	(7)	N/A	
		· Parking provision, e.g. drop bars, EV charging layout	N/A		√		√		√		√		N/A	
1.5.8	Design BIM Model during Construction stage (By Designer)	· (By designer) continuously update applicable design BIM models, drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√	(7)	N/A	(3)
		· (By designer) finalised Design BIM Model	N/A		N/A		N/A		N/A		√		√	
1.6	Landscape													
1.6.1	Tree Matter	· Tree survey plan for existing trees within site and in proximity of the site, including slope trees, OVTs for their height, spread & DBH etc.	√		√		√		N/A		N/A		N/A	
		· Topographic survey with slope trees	√	(1)	√	(2)	√	(4)	N/A		N/A		N/A	
		· Tree preservation & removal proposal (TPRP)	√		√		√		N/A		N/A		N/A	
1.6.2	Development Parameters (Landscape-related)	· Green coverage	√		√		√		N/A		N/A		N/A	
		· Local open space	√		√		√							
		· Communal play area (CPA)	√		√		√							
		· Ball court	√	(1)	√	(2)	√	(4)						
		· Nursery & community farm	√		√		√		N/A		N/A		N/A	
		· Bicycle parking area	√		√		√		N/A		N/A		N/A	
1.6.3	Soft Landscaping	· Incorporation of tree survey plan and TPRP	N/A		√		√		N/A		N/A		N/A	
		· Planting plan & plant schedule	N/A		√	(2)	√	(3)	√	(5)	√	(5)	N/A	
		· Provision of soft landscape library for BIM, e.g. plant species, height, spread, size, spacing, etc.	N/A		√		√		√		√		N/A	
1.6.4	Hard Landscaping	· Planter, vertical green, podium green, green roof	N/A		√		√		√		√		N/A	
		· Zero irrigation system (ZIS), auto irrigation system and water point	N/A		√	(2)	√	(4)	√	(5)	√	(5)		
		· Chess table, bench, trellis, pavilion, CPA, ball court, table tennis table, community farm, bicycle parking, water features, etc.	N/A		√		√		√		√		N/A	
1.6.5	Design BIM Model during Construction stage (By Designer)	· (By designer) continuously update applicable design BIM models, drawings and information input during Construction stage	N/A		N/A		N/A		N/A		√	(4)	N/A	(2)
		· (By designer) finalised Design BIM Model	N/A		N/A		N/A		N/A		√		√	

2	**Design Reviews**												
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)										
			IF		SD		DD		TE		CS		AB
2.1	Design reviews												
2.1.1	Design intent demonstration	· Massing model to illustrate architectural concept	√		N/A		N/A		N/A		N/A		N/A
		· Design visualization & presentation	√		√		√		N/A		N/A		N/A
		· Rendered still shots, animated BIM renditions, fly through and walk through visualization	N/A		√		√		√		√		N/A
		· Public consultations & community engagement	N/A	(2)	√	(4)	N/A	(4)	N/A	(4)	N/A	(4)	N/A
		· Circulation pattern at public transport interchange	N/A		√		N/A		N/A		N/A		N/A
		· Construction planning and safety	N/A		N/A		N/A		√		√		N/A
2.1.2	Model reviews	· Compare design with project requirements	√		√		√		N/A		N/A		N/A
		· Preview spaces and layouts in BIM models	N/A		√		√		√		√		N/A
		· Check layout, sightlines, lighting, security, disabled access and egress, way finding, ergonomics, acoustics, textures and colours, etc	N/A	(1)	√	(2)	√	(2)	√	(2)	√	(2)	N/A
		· Stakeholders to provide feedback and validate design	√		√		√		√		√		N/A
3	**Existing Conditions Modelling**												
3.1	Existing Condtions Survey												
3.1.1	Civil	· Existing road and infrastructure	√	(3)	√	(3)	N/A		N/A		√	(3)	N/A
		· Existing underground drain	√		√		N/A		N/A		√		N/A
3.1.2	Ground Investigation	· Existing underground condition	√	(3)	√	(3)	N/A		N/A		√	(3)	N/A
		· Existing bore log information	√		√		N/A		N/A		√		N/A
3.1.3	Building Structures	· Existing building structures by laser scanning / manual modelling	√	(3)	√	(3)	N/A		N/A		√	(3)	N/A
3.1.4	Underground Structures	· Existing underground structures by manual modelling	√	(3)	√	(3)	N/A		N/A		√	(3)	N/A
3.1.5	Architectural	· Existing building layout by laser scanning / manual modelling	√	(3)	√	(3)	N/A		N/A		√	(3)	N/A
3.1.6	Drainage	· Existing building drainage	√	(4)	√	(4)	N/A		N/A		√	(4)	N/A
		· Existing external aboveground drainage	√		√		N/A		N/A		√		N/A
3.1.7	Building Services	· Existing internal services by manual modelling	√		√		N/A		N/A		√		N/A
		· Existing external services by manual modelling	√	(6)	√	(6)	N/A		N/A		√	(10)	N/A
		· Existing building services installations by laser scanning	N/A		N/A		N/A		N/A		√		N/A
3.1.8	Tree Survey	· Tree survey plan for existing trees within site and in proximity of the site, including slope trees, OVTs & potential OVTs, for their height, spread & DBH etc.	√	(3)	N/A		N/A		N/A		N/A		N/A
3.1.9	Topographic	· Topographic survey	√		√		N/A		N/A		√		N/A
		· GIS	√	(2)	√	(2)	N/A		N/A		√	(2)	N/A
		· 3D terrain by 3D site scanning (LiDAR / photogrammetry)	√		√		N/A		N/A		√		N/A
3.1.10	Surrounding context	· 3D model from LandsD	√	(2)	√	(2)	N/A		N/A		√	(2)	N/A
		· 3D site scanning (LiDAR / photogrammetry)	√		√		N/A		N/A		√		N/A
3.1.11	Underground Utilities	· Records from utility companies	√	(2)	N/A	(2)	N/A		N/A		N/A	(7)	N/A
		· Concealed drainage laser scanning	N/A		N/A		N/A		N/A		√		N/A
3.1.12	Existing Conditions Update	· Existing conditions update, if applicable	N/A		√	(2)	√	(2)	√	(2)	√	(2)	√ (2)
3.2	Existing Conditions Modelling												
3.2.1	Existing Conditions Modelling	· Point cloud and mesh model from survey to BIM / GIS model	√		√		N/A		N/A		√		N/A
		· Models georeferenced to Hong Kong 1980 Grid System	√	(3)	√	(3)	√	(2)	√	(2)	√	(3)	√ (2)
		· Incorporate existing conditions models into design / construction / as-built BIM models	√		√		√		√		√		√
4	**Site Analysis**												
4.1	Site Analysis												
4.1.1	Project Feasibility Study (PFS)	· Project Feasibility Study (PFS)	√	(1)	N/A		N/A		N/A		N/A		N/A
4.1.2	Architecture Feasibility Studies (AFS)	· Architecture Feasibility Studies (AFS)	√	(1)	N/A		N/A		N/A		N/A		N/A
4.1.3	Planning and Engineering Study (PES)	· Planning and Engineering Study (PES)	√	(1)	N/A		N/A		N/A		N/A		N/A
4.1.4	Site Planning	· 3D terrain & building massing	√	(1)	N/A		N/A		N/A		N/A		N/A
4.1.5	Visual Impact Assessment (VIA) (GIS Integration)	· View corridor and sightline studies	√	(1)	√	(1)	N/A		N/A		N/A		N/A
		· Ridgeline analysis	√		√		N/A		N/A		N/A		N/A
4.1.6	Spatial Planning	· Connection between proposed buildings, external works, open spaces & landscape areas	√		N/A		N/A		N/A		N/A		N/A
		· Estate-wide facility management, nearby community facilities		(2)		(2)							
		· Schemes Comparison	N/A		√		N/A		N/A		N/A		N/A
4.2	Master Layout Study												
4.2.1	Master Layout Study	· Assisted with 3D (BIM and/or GIS) Model	√	(2)	N/A		N/A		N/A		N/A		N/A

No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)											
			IF		SD		DD		TE		CS		AB	
5	**3D Coordination**													
5.1	Clash Management													
5.1.1	Clash Detection	· Federation of BIM models from different disciplines	N/A		√		√		√		√		N/A	
		· Identify clashes	N/A		√	(2)	√	(3)	√	(3)	√	(3)	N/A	
		· Regular re-run of process	N/A		√		√		√		√		N/A	
5.1.2	Clash Reporting	· Report clashes and its process	N/A		√		√		√		√		N/A	
		· Report outcome of clash detection	N/A		√	(3)	√	(3)	√	(3)	√	(3)	N/A	
		· Report categorization and prioritization output	N/A		√		√		√		√		N/A	
		· Assign responsibilities / action parties	N/A		√		√		√		√		N/A	
5.1.3	Clash Prioritization	· Workflow and methodology to categorize and prioritize clash detection results	N/A		√	(4)	√	(5)	√	(5)	√	(5)	N/A	
		· Categorize and prioritize of clashes	N/A		√		√		√		√		N/A	
5.1.3	Clash Visualization	· Workflow and methodology to visualize / feedback clash detection results to BIM models	N/A		√	(4)	√	(5)	√	(5)	√	(5)	N/A	
		· Categorize and prioritize of clashes	N/A		√		√		√		√		N/A	
5.1.3	Clash Elimination	· Revise design to eliminate clashes	N/A		√	(5)	√	(6)	√	(6)	√	(8)	N/A	
		· Responsible parties to update BIM models	N/A		√		√		√		√		N/A	
5.2	Design Validation													
5.2.1	Combined Services Coordination	· At congested area & critical headroom area	N/A		N/A		√		N/A		√		N/A	
		· Discover exposed services	N/A		N/A		√		N/A		√		N/A	
		· Prevent water pipes through water sensitive rooms	N/A		N/A		√		N/A		√		N/A	
		· Maintenances space / platforms requirements	N/A		N/A		√	(9)	N/A		√	(10)	N/A	
		· Validation by partial clash detection	N/A		N/A		√		N/A		√		N/A	
		· CSD in 3D	N/A		N/A		N/A		N/A		√		N/A	
		· Validation by full clash detection before construction	N/A		N/A		N/A		N/A		√		N/A	
5.2.2	Combined Builders Work Coordination	· Services requiring structural openings	N/A		N/A		√		N/A		√		N/A	
		· Services through compartment or FRR walls	N/A		N/A		√	(9)	N/A		√	(10)	N/A	
		· Full CBWD plans and elevations	N/A		N/A		N/A		N/A		√		N/A	
		· CBWD for structural opening	N/A		N/A		N/A		N/A		√		N/A	
5.2.3	Structural Columns and Walls Locations	· Coordination between architectural and structural layout	√	(1)	√	(4)	√	(5)	N/A		N/A		N/A	
5.2.4	Headroom Checking	· Working area	N/A		N/A		√		N/A		√		N/A	
		· Corridor width	N/A		N/A		√	(5)	N/A		√	(5)	N/A	
		· Staircase height	N/A		N/A		√		N/A		√		N/A	
5.2.5	Ceiling Design	· False ceiling design, ceiling mounted light fittings, FS equipment and air grilles coordination	N/A		N/A		√	(5)	N/A		√	(5)	N/A	
		· Coordination for services inside ceiling void	N/A		N/A		√		N/A		√		N/A	
5.2.6	Tree Protection Zone (TPZ)	· Coordination between tree protection zone and other architectural and structural layout	√	(1)	√	(2)	√	(3)	√	(3)	√	(3)	N/A	
6	**Cost Estimation**													
6.1.1	BIM for cost estimation and quantity take-off	· (By Designers) facilitate PQS to use BIM for cost estimation and quantity take-off (refer to Annex ANN-1.4 of this Guide for applicable items)	N/A		N/A		√	(2)	√	(2)	N/A	(2)	N/A	
		· (By PQS) use BIM for cost estimation and quantity take-off as far as practicable	N/A		N/A		√	(5)	√	(5)	N/A	(5)	N/A	
		· (By Contractors) use BIM to facilitate cost evaluation on variation works as far as practicable	N/A		N/A		N/A		N/A		√		N/A	
7	**Engineering Analysis**													
7.1	Structural Analysis													
7.1.1	Structural Analysis	· Synchronise analysis model and design BIM model to conduct structural analysis for superstructure and / or foundation design	N/A		√	(3)	√	(4)	√	(4)	√	(3)	N/A	
7.2	Environment: Passive													
7.2.1	Air Ventilation Assessment (AVA)	· Integrated use with CFD software	N/A		N/A	(3)	N/A	(4)	N/A		N/A		N/A	
		· Air Ventilation Assessment (AVA)	N/A		√		√		N/A		N/A		N/A	
7.2.2	Microclimate Studies	· Airflow simulation & ventilation	N/A		√		N/A		N/A		N/A		N/A	
		· Wind environment at low level / mid level	N/A		√	(4)	N/A	(4)	N/A		N/A		N/A	
		· Microclimate studies	N/A		N/A		√		N/A		N/A		N/A	
7.2.3	Solar Study	· Shadow & daylight analysis	N/A		√	(3)	√	(3)	N/A		N/A		N/A	
		· Daylight provision, open space solar access hour study	N/A		√		√		N/A		N/A		N/A	
7.2	Energy: Active													
7.2.1	Lighting Analysis	· Exporting Lighting layout for Lighting simulation by DIALux	N/A		N/A		√	(4)	√	(2)	N/A		N/A	
		· Optimization of lighting design for energy saving	N/A		N/A		√		√		N/A		N/A	

No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)									
			IF		SD		DD		TE		CS		AB	
		(Currently not used in HA Works)												
8	**Facility Energy Analysis**													
9.1	Sustainability Evaluation													
9.1.1	BEAM Plus evaluation	· Comply with the requirements of BEAM Plus New Buildings Version 2.0 IDCM 16 (a). BIM Integration - Coodinated Use of BIM within Design Teams	N/A		N/A		√		√		N/A		N/A	
		· Comply with the requirements of BEAM Plus New Buildings Version 2.0 IDCM 16 (b). BIM Integration - Coordinated Use of BIM within Design and Construction Teams	N/A		N/A		N/A	(1)	N/A	(1)	√	(1)	√	(1)
10	**Space Programming**													
10.1	Space programming													
10.1.1	Compliance with spatial requirements and/or statutory compliance	· checking and verifying spatial requirements and/or statutory compliance,	N/A		√		√		N/A		N/A		N/A	
		· Preparation of GBP submission with demonstration of compliance	N/A		N/A	(2)	√	(3)	N/A	(2)	N/A	(2)	N/A	
		· Continuous update of design BIM model and GBP amendment, if applicable	N/A		N/A		√		√		√		N/A	
10.1.2	Spatial Planning	· Diagrams showing functional analysis between spaces	N/A		√		√		N/A		N/A		N/A	
		· Schemes Comparison	N/A		√	(2)	√	(3)	N/A	(2)	N/A	(2)	N/A	
		· Continuous update of design BIM model and diagram, if applicable	N/A		N/A		√		√		√		N/A	
11	**Phase Planning (4D Modelling)**													
11.1	Construction Sequence													
11.1.1	Sequencing of Works	· Detailed planning and design on 4D modelling as considered appropriate	N/A		N/A		√		√		N/A		N/A	
		· Method statement on ELS, foundation, superstructure, temporary works and any other particular items as considered appropriate	N/A		N/A		N/A		√		N/A		N/A	
		· Construction planning and 4D simulation on ELS, foundation, superstructure, temporary works and any other particular items as considered appropriate	N/A		N/A		N/A		N/A		√		N/A	
		· 4D simulation of MiC and DfMA elements / units from fabrication, transportation and installation on site	N/A		N/A		√	(3)	√	(4)	√	(6)	N/A	
		· Swept path analysis for delivery route	N/A		N/A		√		√		√		N/A	
		· Enable further development for cost estimation / 5D model as considered appropriate	N/A		N/A		√		√		√		N/A	
		· Construction system design (e.g. formwork and scaffolding)	N/A		N/A		N/A		N/A		√		N/A	
		· Reporting project progress	N/A		N/A		N/A		N/A		√		N/A	
11.1.2	Animation, Design Visualization and Presentation	· Existing site contour, location, gradients and drainage patterns, access and circulation patterns, footbridge construction, traffic diversion etc.	N/A		N/A		√		√		√		N/A	
		· Description of the Phase Planning, including assumptions, time interval, construction method statement, etc.	N/A		N/A		√		√		√		N/A	
		· Animated models, fly-throughs, static 3D renderings, 4D process sequencing	N/A		N/A		√		√		√		N/A	
		· Models for the Phase Planning (4D modelling)	N/A		N/A		√	(4)	√	(4)	√	(6)	N/A	
		· Native and editable BIM models	N/A		N/A		√		√		√		N/A	
		· Linked project programme or spreadsheet or equivalent	N/A		N/A		N/A		N/A		√		N/A	
		· Videos to reflect planned progress against actual progress	N/A		N/A		N/A		N/A		√		N/A	
12	**Digital Fabrication**													
12.1	Digital Fabrication													
12.1.1	Prefabricated, MiC and DfMA units / elements	· Prepare fabrication models from design BIM models for prefabricated, MiC and DfMA units / elements	N/A		N/A		√	(5)	√	(6)	√	(7)	N/A	
		· Produce fabrication drawings (schedules, plans, sections, elevations 3D and details) from fabrication models	N/A		N/A		√		√		√		N/A	
13	**Site Utilization Planning**													
13.1	Site Logistics Planning													
13.1.1	Site Layout & Logistics Planning	· 2D / 3D / 4D presentations	N/A		N/A		N/A		N/A		√		N/A	
		· Produce various views from desired viewpoints	N/A		N/A		N/A		N/A		√		N/A	
		· Site area or space reservations	N/A		N/A		N/A		N/A		√	(5)	N/A	
		· Site walkways	N/A		N/A		N/A		N/A		√		N/A	
		· 3D site scan	N/A		N/A		N/A		N/A		√		N/A	
13.1.2	Minimize Cut & Fill for Site Formation Works	· Minimize Cut & fill for Site Formation Works	N/A		N/A		N/A		N/A		√	(5)	N/A	
13.1.3	Construction Lift, Material Hoist & Tower Crane Planning	· Construction Lift, Material Hoist & Tower Crane Planning	N/A		N/A		N/A		N/A		√	(5)	N/A	
13.2	Safety Planning													
13.2.1	Site Safety Planning	· Risk zones related to cranes	N/A		N/A		N/A		N/A		√	(5)	N/A	
		· Other safety hazards e.g. cable, pipe lines excavation, asbestos	N/A		N/A		N/A		N/A		√		N/A	
13.3	Temporary Works Design													
13.3.1	Temporary Works Design	· Temporary Works Design	N/A		N/A		N/A		N/A		√	(5)	N/A	
14	**3D Control and Planning**													
14.1	3D Control and Planning													
14.1.1	Digital Layout	· link BIM models with HK1980 Grid System	N/A		N/A		N/A		N/A		√		N/A	
		· adoption of machinery with Global Positioning System (GPS) capabilities and digital layout equipment together with corresponding software	N/A		N/A		N/A		N/A		√		N/A	
		· Set out the control points in BIM models	N/A		N/A		N/A		N/A		√	(3)	N/A	
		· Set out the above control points on site and carry out physical layout based on those points and BIM models	N/A		N/A		N/A		N/A		√		N/A	
		· Verify aligned digital information produced from surveying equipment with BIM models based on the specified tolerances	N/A		N/A		N/A		N/A		√		N/A	

15	**As-built Modelling**													
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)											
			IF		SD		DD		TE		CS		AB	
15.1	On-site Verification													
15.1.1	On-site Verification	· Verify the site condition against the As-built BIM models using following methods as considered appropriate	N/A		N/A		N/A		N/A		N/A		√	
		· Inspection	N/A		N/A		N/A		N/A		N/A		√	
		· Site photos, 360-degree spherical panoramic photographic records	N/A		N/A		N/A		N/A		N/A		√	(6)
		· Photogrammetry	N/A		N/A		N/A		N/A		N/A		√	
		· Laser scanning	N/A		N/A		N/A		N/A		N/A		√	
15.1.2	Concealed Building Services & Underground Utilities	· Site photos, 3D laser scanning / 360-degree photo record before building services and underground utilities, drainage, etc., being concealed	N/A		N/A		N/A		N/A		√	(8)	N/A	
15.2	As-built Modelling													
15.2.1	As-built Modelling	· Contractor to produce and handover full set of As-built BIM models reflecting actual physical conditions of the Works	N/A		N/A		N/A		N/A		N/A		√	
		· Civil - Road and infrastructure, underground drain	N/A		N/A		N/A		N/A		N/A		√	
		· Foundation and building structure elements	N/A		N/A		N/A		N/A		N/A		√	
		· Underground geological profiles and / or rockhead contour based on information from Geotechnical investigation reports	N/A		N/A		N/A		N/A		N/A		√	
		· Architectural elements	N/A		N/A		N/A		N/A		N/A		√	(10)
		· Building Services elements	N/A		N/A		N/A		N/A		N/A		√	
		· Underground utilities	N/A		N/A		N/A		N/A		N/A		√	
		· Topographic records	N/A		N/A		N/A		N/A		N/A		√	
		· Incorporation of surround context	N/A		N/A		N/A		N/A		N/A		√	
15.2.2	Foundation (As-built documentation associated with BIM models)	· Dates of each major pile construction activity (e.g. Pre-drilling, excavation, reinforcement fixing, concreting)	N/A		N/A		N/A		N/A		N/A		√	
		· Dates of testings (e.g. post-drill full concrete coring test, ultrasonic test, etc.)	N/A		N/A		N/A		N/A		N/A		√	(3)
		· As-built record plans of the foundations including piles, pile caps and footings	N/A		N/A		N/A		N/A		N/A		√	
15.2.3	Superstructure (As-built documentation associated with BIM models)	· Test reports for concrete cubes, reinforcement, structural steel, glass, etc.	N/A		N/A		N/A		N/A		N/A		√	(5)
		· As-built record plans of the superstructure and any other contractor's design and build items	N/A		N/A		N/A		N/A		N/A		√	

16	**Project System Analysis**													
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)											
			IF		SD		DD		TE		CS		AB	
(Currently not used in HA Works)														

17	**Maintenance Scheduling**													
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)											
			IF		SD		DD		TE		CS		AB	
(Currently not used in HA Works)														

18	**Space Management and Tracking**													
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)											
			IF		SD		DD		TE		CS		AB	
(Currently not used in HA Works)														

19	**Asset Management**													
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)											
			IF		SD		DD		TE		CS		AB	
(Currently not used in HA Works)														

20	Drawing Generation (Drawing Production)												
No.	BIM Application Examples	Task Examples	Project Stage & Milestone (Relative Effort in brackets)										
			IF		SD		DD		TE		CS		AB	
20.1	Drawing Generation													
20.1.1	Drawing Generation	· Use BIM for generating applicable drawings as listed in 20.2 - 20.5, unless justified that it is technically impracticable	√	-	√	-	√	-	√	-	√	-	√	-
20.1.2	List of Drawing	· Create drawing list registry in BIM and indicate authoring software for each drawings	√	(1)	√	(1)	√	(2)	√	(2)	√	(3)	√	(3)
20.2	Design and Presentation Drawings													
20.2.1	Design and Presentation Drawings	· Master Layout Plan	√	(1)	√	(2)	N/A		N/A		N/A		N/A	
		· Development Plan	√		√		N/A		N/A		N/A		N/A	
		· Preliminary area schedules embedded in BIM models and produced in drawings	√		√		N/A		N/A		N/A		N/A	
		· Other applicable preliminary design and presentation drawings	√		√		N/A		N/A		N/A		N/A	
20.3	ICU Submissions													
20.3.1	Architectural	· General building plan (GBP)	N/A		N/A		√	(6)	√	(6)	√	(6)	N/A	
		· Drainage plan	N/A		N/A		√		√		√		N/A	
20.3.2	Structural	· Superstructure plan	N/A		N/A		√	(6)	√	(6)	√	(6)	N/A	
		· Foundation plan	N/A		N/A		√		√		√		N/A	
		· Excavation and Lateral Support (ELS) plan	N/A		N/A		√		√		√		N/A	
20.3.3	Other	· Site formation plan	N/A		N/A		√	(4)	√	(4)	√	(4)	N/A	
		· Demolition plan	N/A		N/A		√		√		√		N/A	
		· Hoarding plan	N/A		N/A		√		√		√		N/A	
20.3.4	Items determined with BIM	· Fundamental checking equivalent to the Standards as per current practice notes	N/A		N/A		√	(3)	√	(3)	√	(3)	N/A	
		· Checking of development / planning restrictions, including but not be limited to gross floor area, building heights, no. of storeys, absolute height of	N/A		N/A		√		√		√		N/A	
		· Checking of means of escape and means of access	N/A		N/A		√		√		√		N/A	
		· Checking of sanitary fitment provision	N/A		N/A		√		√		√		N/A	
		· Checking of fire compartment and fire resisting construction	N/A		N/A		√		√		√		N/A	
		· Checking of building bulk and separation	N/A		N/A		√		√		√		N/A	
		· Identification of the material and description according to the preferred colours	N/A		N/A		√		√		√		N/A	
20.4	Tender and Workings Drawings													
20.4.1	Tender and Workings Drawings	· Drawing list generated from BIM	N/A		N/A		N/A		√	(10)	√	(10)	N/A	
		· General layout plans	N/A		N/A		N/A		√		√		N/A	
		· Sections and elevations	N/A		N/A		N/A		√		√		N/A	
		· Schedules	N/A		N/A		N/A		√		√		N/A	
		· Details	N/A		N/A		N/A		√		√		N/A	
		· Building Services design drawings and equipment schedules	N/A		N/A		N/A		√		√		N/A	
20.5	Construction and Shop Drawings / As-built drawings													
20.5.1	Construction and Shop Drawings	· Combined Services Drawings (CSD)	N/A		N/A		N/A		√	(10)	√	(10)	N/A	
		· Combined Builder's Work Drawings (CBWD)	N/A		N/A		N/A		√		√		N/A	
		· Individual Services Drawings (ISD)	N/A		N/A		N/A		√		√		N/A	
		· Shop Drawings	N/A		N/A		N/A		√		√		N/A	
		· Fabrication drawings (verified on site)	N/A		N/A		N/A		√		√		N/A	
		· Building Services design drawings and equipment schedules	N/A		N/A		N/A		√		√		N/A	
20.5.2	As-built Drawings	· All applicable As-built record drawings generated from As-built BIM models (verified on site)	N/A		N/A		N/A		N/A		N/A		√	(10)

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Annexes

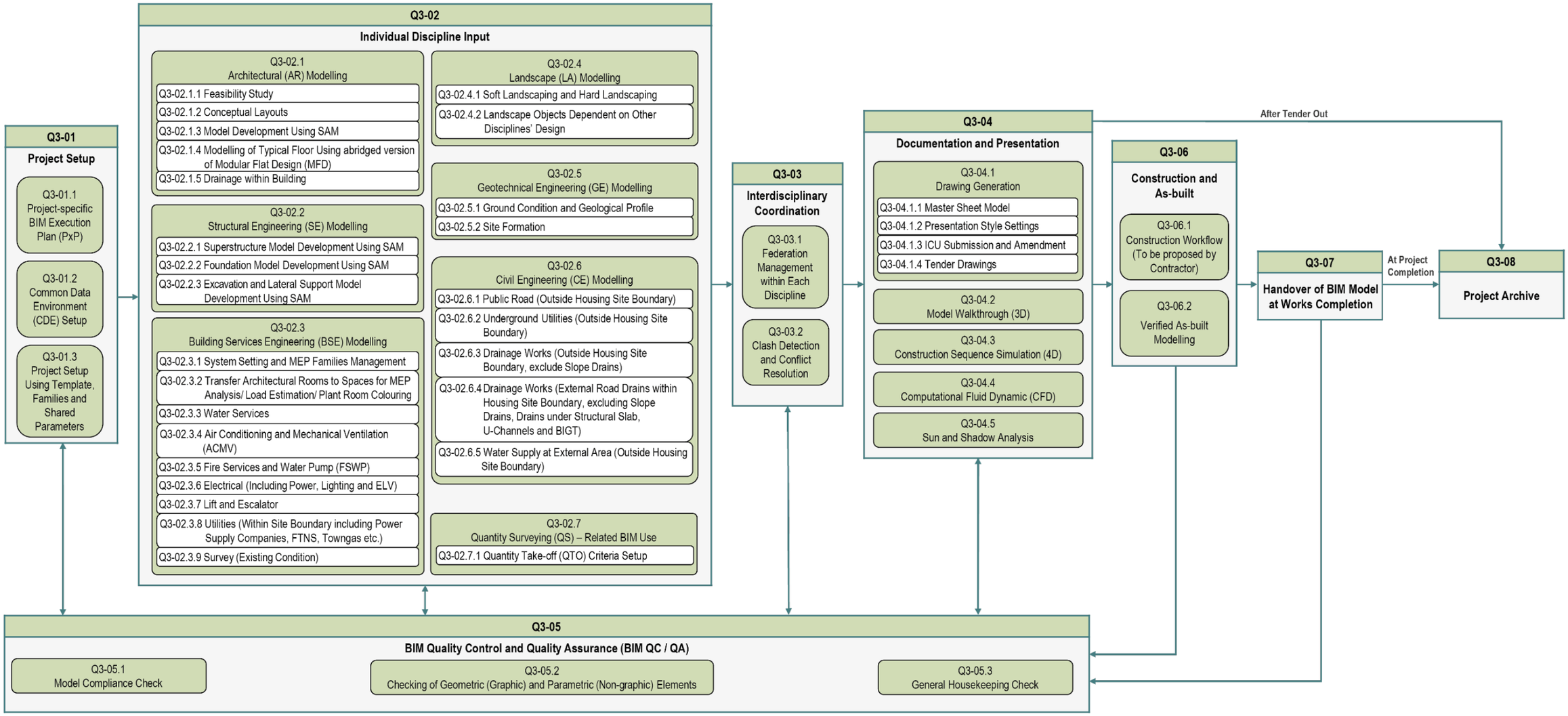
Q3 Quick Guide Level 3 – BIM Workflow

Q3 Index: HA Overall BIM Workflow Diagram

Quick Guide Level 3 (Q3) contains HA-specific lifecycle workflows spanning from project setup to post-completion and asset management. It also serves as an index for users to find corresponding detailed Standard Approaches to Modelling (SAM) when performing a specific task.

The diagram below shows the relationship between individual workflows, which altogether form the overall workflow applicable to HA projects. The diagram also serves as an index for locating individual workflows in detail.

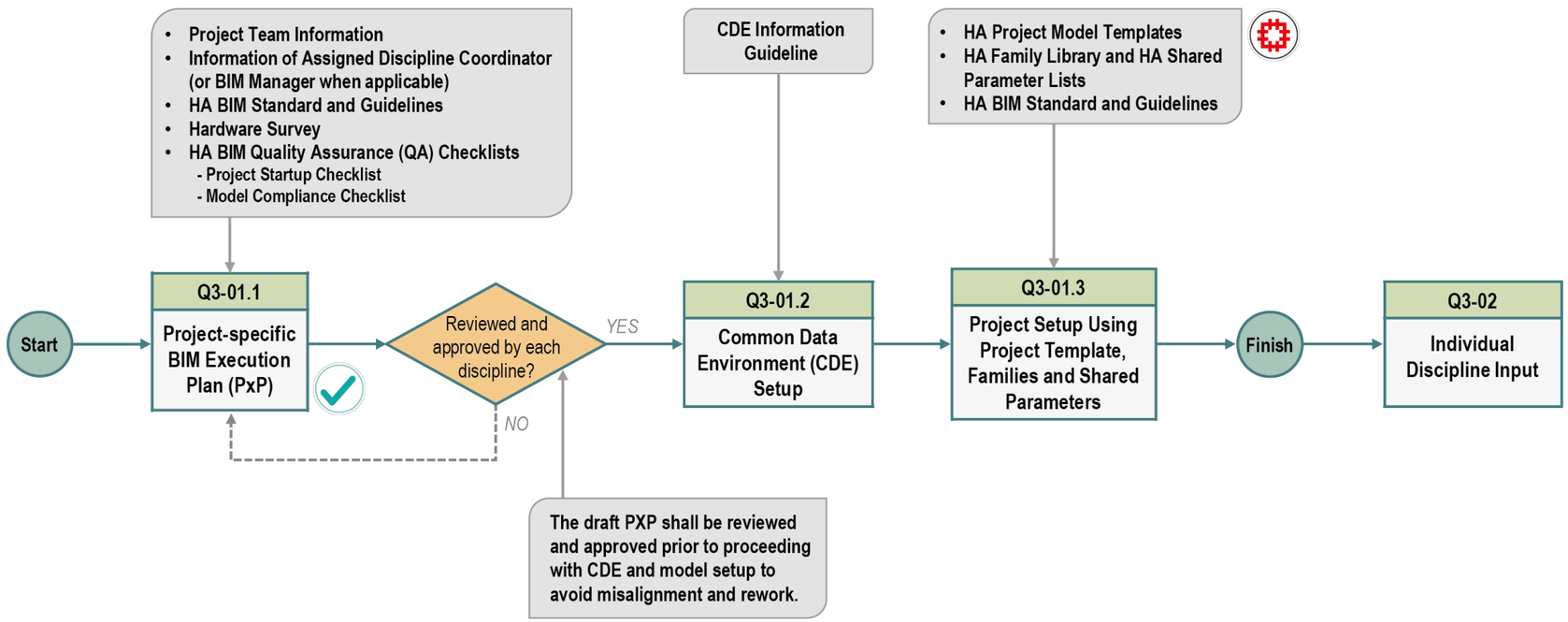
The workflow diagrams containing symbols have been devised for HABIMSG which requires users' attention. The symbols being applied throughout HABIMSG either signify the importance of the relevant sections or carries specific implications. See Section 1.6 for a list of symbols and their corresponding definitions.



Q3-01 Project Setup

Prior to starting of modelling activities, PTs / PSPs / Contractors / BIMSPs shall complete the Project Setup workflow in order to achieve a common understanding of project compliance basis while establishing project-specific requirements and guidelines.

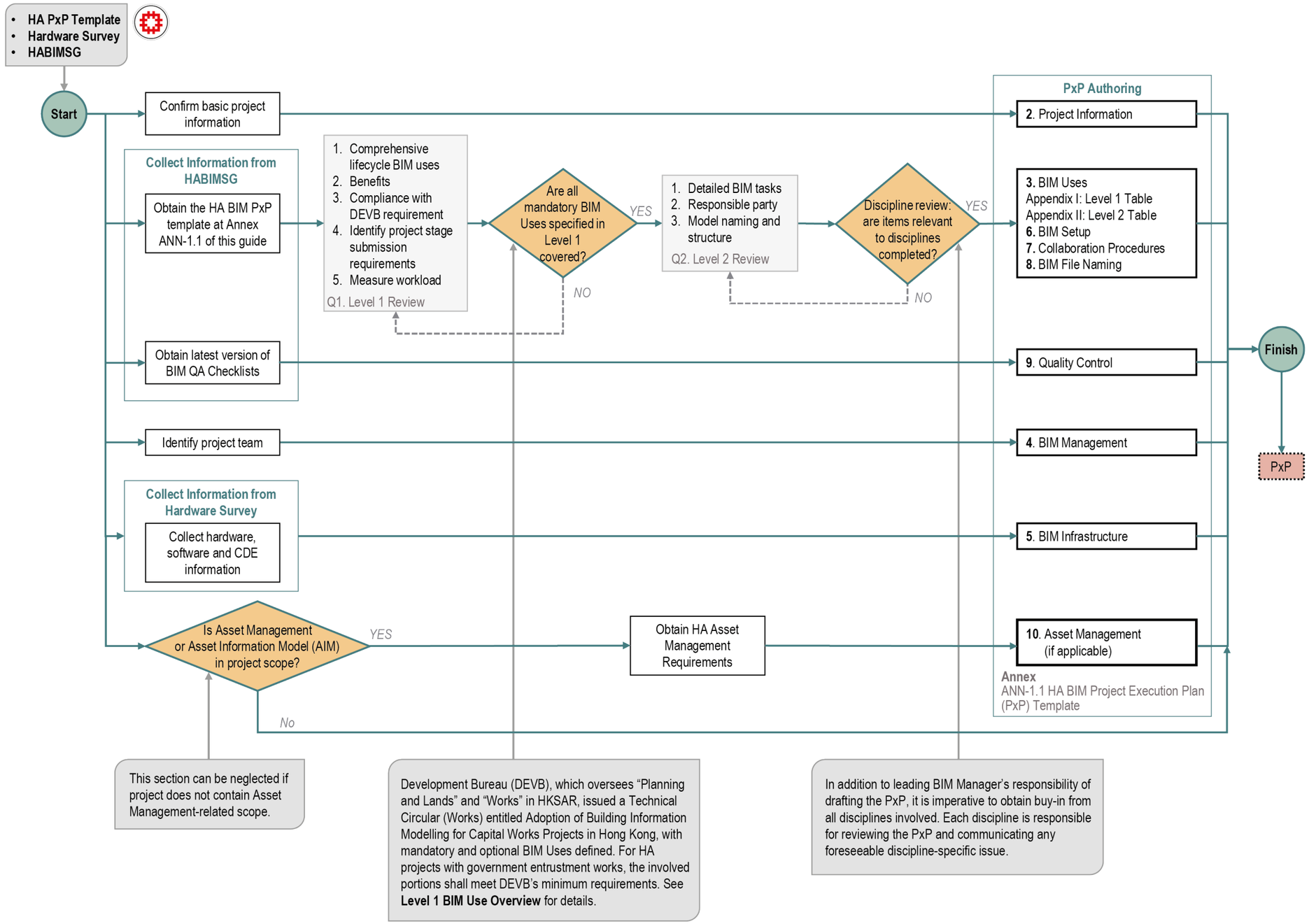
All necessary supplementary BIM resources including but not be limited to the HA Project Model Templates, Abridged Version of Modular Flat Design (MFD) Model, HA Family Library and HA Shared Parameter Lists and HA BIM Quality Assurance (QA) Checklists can be found in the locations as indicated in the **Annex** of this Guide



Q3-01.1 Project-specific BIM Execution Plan (PxP)

PxP drafting shall be led by the BIM Manager by involving key stakeholders of each discipline in the process, and refer to the HA BIM PxP Template at **Annex ANN-1.1** of this Guide for details on contents of each section. It is important to designate **Assigned Discipline Coordinators** who will be responsible for key steps and decision points in forthcoming processes.

HA PxP Template and I.T. Setup Recommendation can be found in the **Annex** of this Guide



Q3-01.2 Common Data Environment (CDE) Setup

Common Data Environment (CDE) setup workflow shown here shall be deemed **applicable for in-house project team during design stage only**.

PSP / Contractor shall observe the clauses on BIM collaboration and CDE requirements stated in the PSP agreement / Works contract preliminaries specification and follow the technological infrastructure as agreed to establish project-specific workflows in similar manner to the workflow diagram shown here and documented in PxP, and shall therefore be finalised after PxP draft is made available.

1. **PSP Agreement**
   Under the PSP agreement, there is no specific requirement on CDE, however, as stated in the agreement, PSP shall establish a BIM collaboration and information sharing methodologies and workflows.

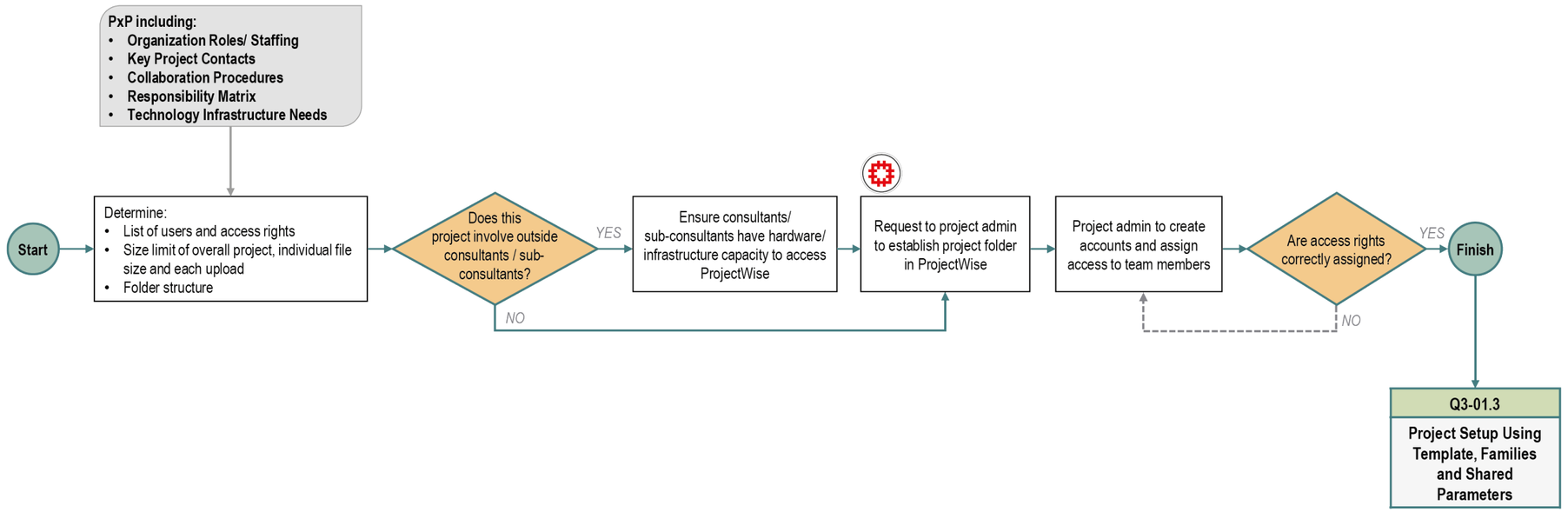
2. **Foundation and Building Works Contract**
   For Foundation and Building Contractor, the Works contract preliminaries specification on clauses regarding BIM CDE requirements shall be referred.

3. **HA In-house Project**
   For HA in-house project, HA currently adopts ProjectWise as the CDE for planning and design stages. It mainly serves as document repository.

Real time collaboration is only applicable to in-house staff using HA network, and requires Windows 10 or above, and the latest version of ProjectWise by the time the project commences.

Are access rights correctly assigned?

Incorrect access rights do not only raise security concerns but also increase chances of accidental data alteration between disciplines. It is therefore important to double check access rights before proceeding to populating CDE with BIM files.



Q3-01.3 Project Setup Using Template, Families and Shared Parameters

1.3b 1.3c

After setting up the CDE, PTs / PSPs / Contractors / BIMSPs shall be ready to set up models by using HA templates.

The main workflow groups contain three tracks that can be conducted in parallel: basic project information, site and project location, and model organization.

Is Worksharing a mandatory BIM process?

Unless otherwise specified, enabling Worksharing is a mandatory BIM process to facilitate the daily model authoring and model management. This shall apply to all project models except for the MFD templates. Details refer to **D2.6** of HABIMSG Vol.2.

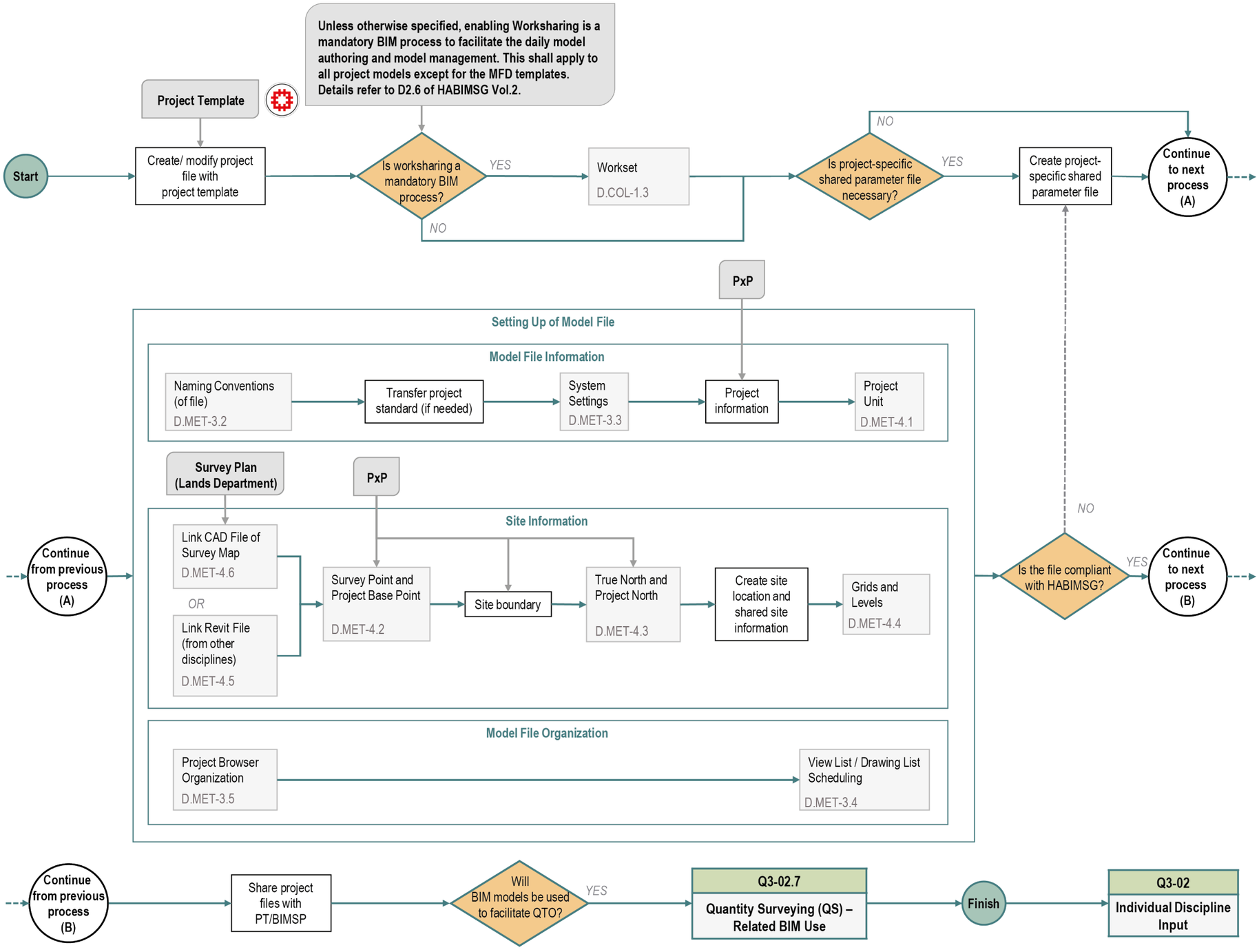
Is the file compliant with HABIMSG?

Refer to HA BIM Checklist for HA's minimum compliance requirements; answer YES only if the ones related to **D.MET-3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5 and 4.6 in D3.3** of HABIMSG Vol.2 are met.

Will BIM models be used to facilitate QTO?

Cost Estimation is a mandatory BIM Use in HA projects. Current BIM QTO scope implemented in HA are listed at **ANN-1.4** in ANN-1 of HABIMSG Annex.

PTs / BIMSPs/ PSPs shall liaise with QS to set up QTO criteria as illustrated in **Q3-02.7** of HABIMSG Vol.1.

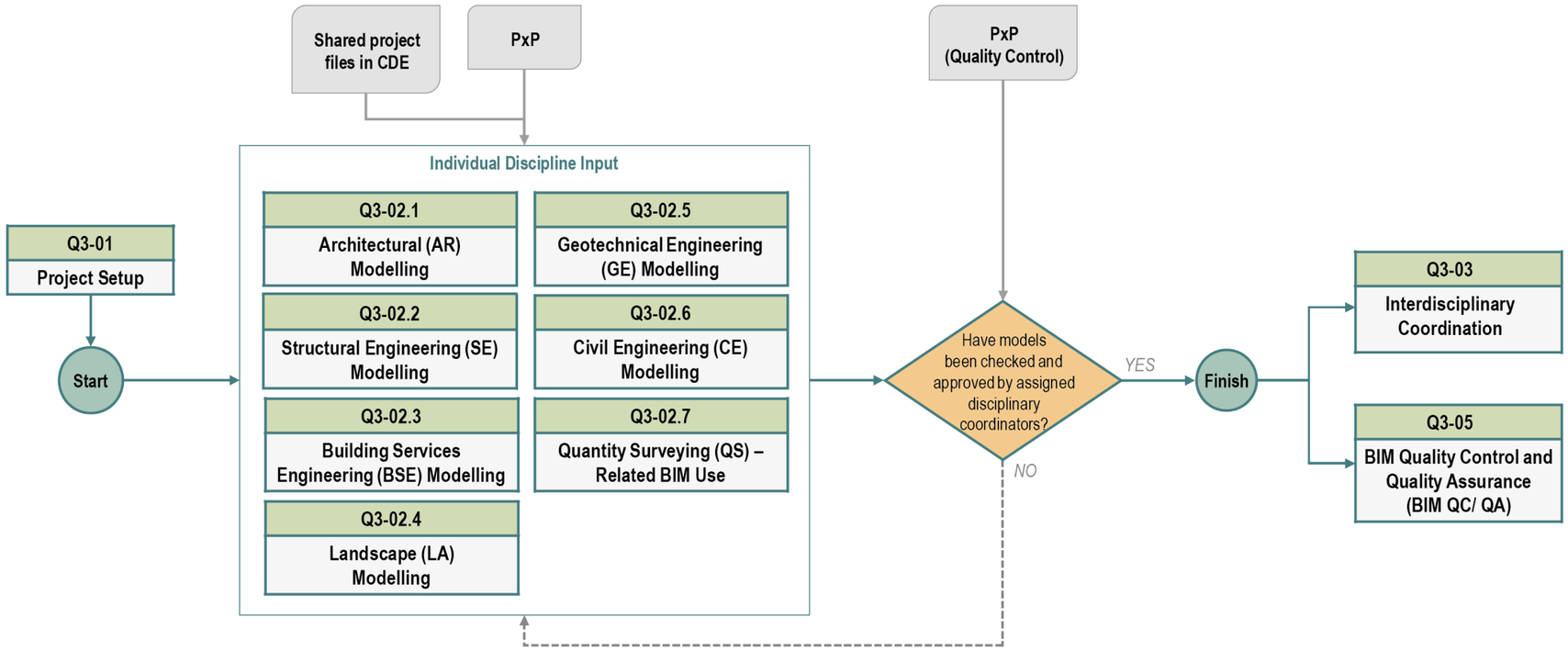


Q3-02 Individual Discipline Input

Upon completion of project setup, model authors may proceed with modelling of each discipline. The workflows in this process group forms the basis for subsequent collaboration, documentation, presentation and BIM Quality Assurance activities.

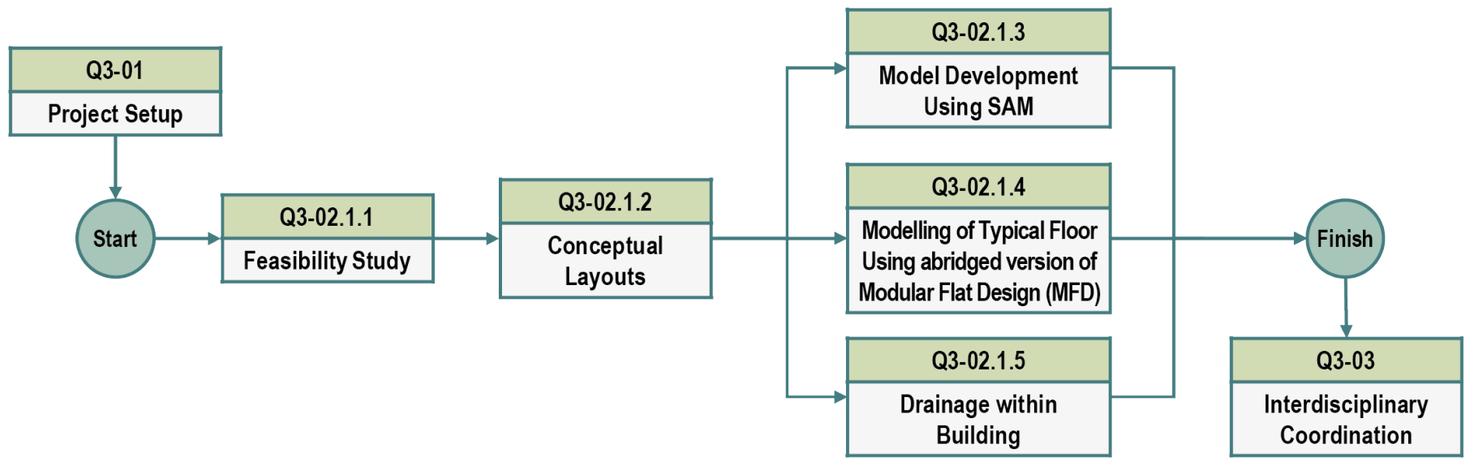
Have models been checked and approved by Assigned Discipline Coordinators?

This decision point indicates that, prior to releasing the models for coordination, basic quality control is required. Discipline Coordinators may also refer to Workflow Group **Q3-5 BIM Quality Control and Quality Assurance(QC / QA)** for comprehensive checking requirements.



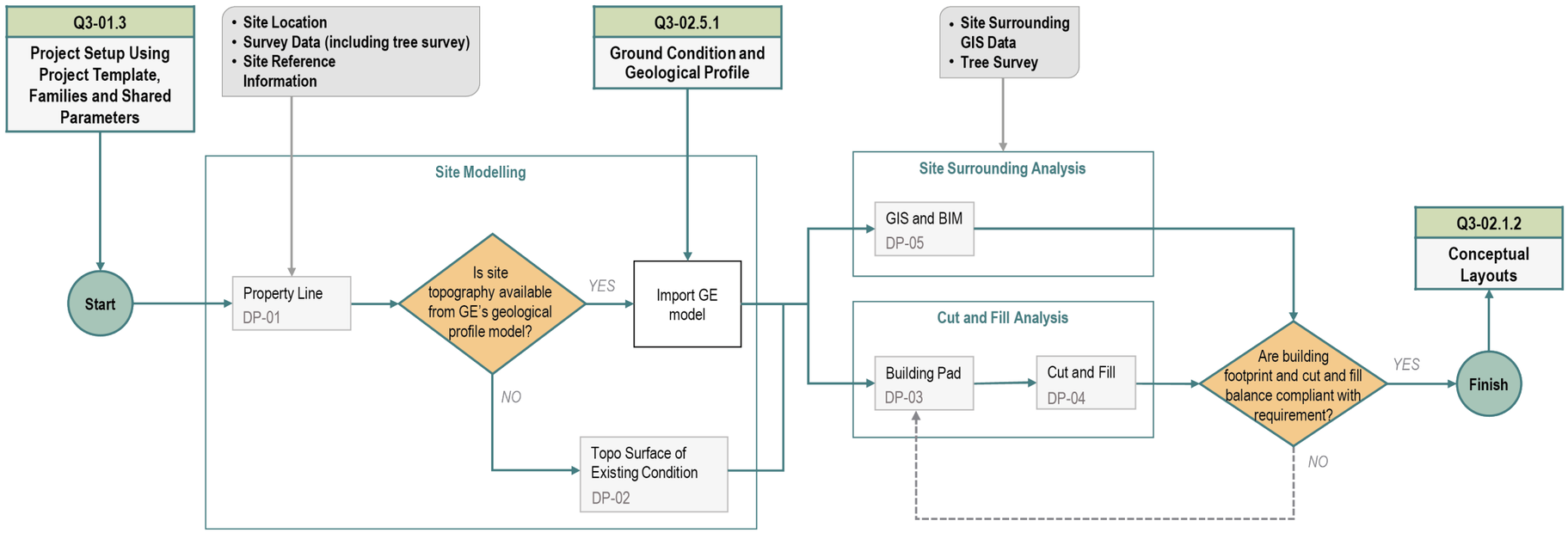
2.1 Q3-02.1 Architectural (AR) Modelling

For Architectural BIM modelling, model authors shall conduct site modelling and analysis prior to concept and massing studies. The model is ready for interdisciplinary collaboration upon full development following Standard Approach to Modelling (SAM) and Modular Flat Design (MFD).



Q3-02.1.1 Feasibility Study

Site modelling and analysis start with modelling of property line and topographical surface using survey data, including tree survey, followed by analysis of site surrounding area using GIS data and analysis of cut and fill, which can be conducted in parallel. The results of the analyses shall be validated with the program or volumetric requirements prior to proceeding with concept and massing studies.



Is site topography available from GE's Geological Profile model?

In case GE's Geological Profile model is available, model authors shall import and make use of this model to avoid duplicated efforts to create site topography via Toposurface.

Are building footprint and cut & fill balance compliant to requirements?

The purpose of cut and fill analysis is to ensure that the footprint and cut and fill are within allowable regulatory and budget constraints.

Q3-02.1.2 Conceptual Layouts

Concept and massing study is critical in validating building GFA and program prior to proceeding with design of architectural elements, for the purpose of balancing building form and program requirements,

Are floor levels defined?

Floor levels are defined with consideration of overall height limit and typical floor height precedents.

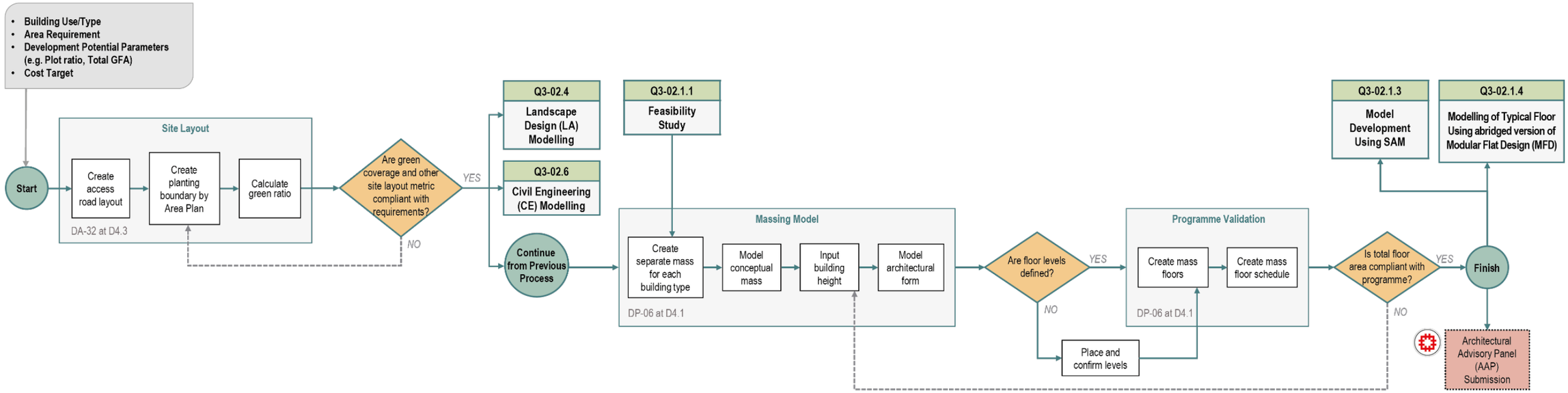
Is total floor area compliant with program?

Total floor area compliance may be achieved by changing floor-to-floor heights (thereby number of floors), podium-to-tower ratio or building form.

Are green ratio and other site layout metric compliant with requirements?

Before landscape design can commence, it is architectural discipline's responsibility to proceed with site layout to ensure that it satisfies the minimum required green ratio. Area Plan can be used to validate the area requirements and green ratios.

The end product, **Architectural Advisory Panel (AAP) Submission**, is a HA-specific document.



Q3-02.1.3 Model Development Using SAM

Following concept massing studies which confirm the building volume configuration, architectural team may proceed to develop architectural discipline models following HA-specific SAM.

Model authors may first build up architectural walls, curtain walls and floors, prior to creating openings (doors, windows) and other interior, detailed or vertical circulation architectural elements.

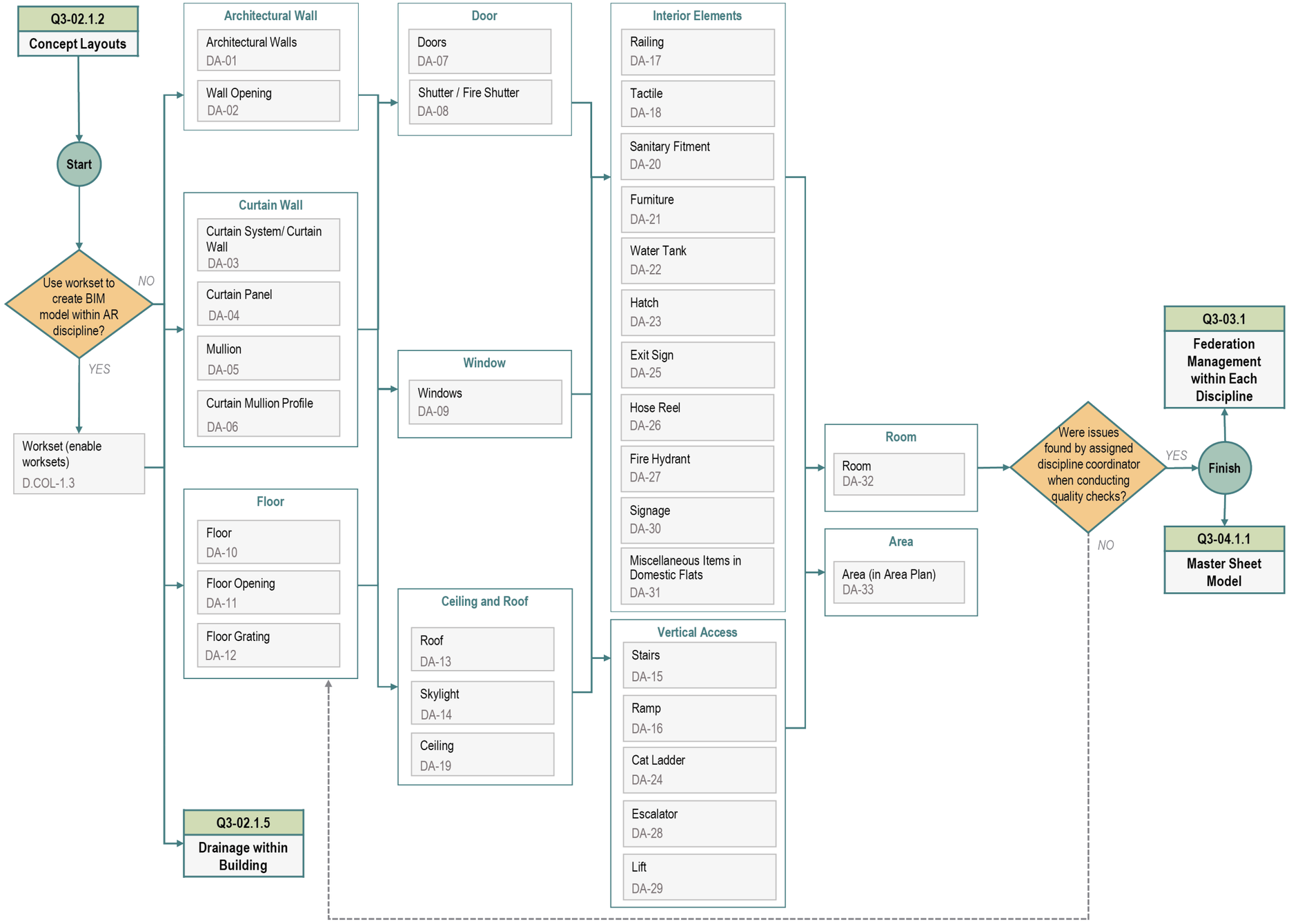
Rooms shall be placed after major architectural model elements (e.g. walls that define the layout) are in place.

Has Workset been enabled in the BIM Model?

Unless otherwise specified, Workset should be enabled when setting up the BIM model at the first place. Details refer to **D2.6** of HABIMSG Vol.2.

Were issues Found by Assigned Discipline Coordinator when conducting quality checks?

This decision point indicates that, prior to releasing the models for coordination, basic quality control is required. Assigned Discipline Coordinator(s) may also refer to Workflow **Q3-5 Quality Control and BIM Quality Assurance(QC/QA)** for comprehensive checking requirements.



Q3-02.1.4 Modelling of Typical Floor Using abridged version of Modular Flat Design (MFD)

1. Abridged version of Modular Flats are self-contained with pre-populated model elements at LOD 300-400 which can facilitate PTs / PSPs work for typical floor design and modelling.

2. The abridged version of MFD templates are available for use. PTs / PSPs should obtain these templates from location specified in **Annex ANN-1.3d.**

3. Should PTs / PSPs find that no MFD templates are suitable due to difference in design, they should create their own MFD model, adhering to the criteria and guidelines as specified in **D.MET-5.1** in D3.5 of HABIMSG Vol.2.

Does individual model include modular flat?

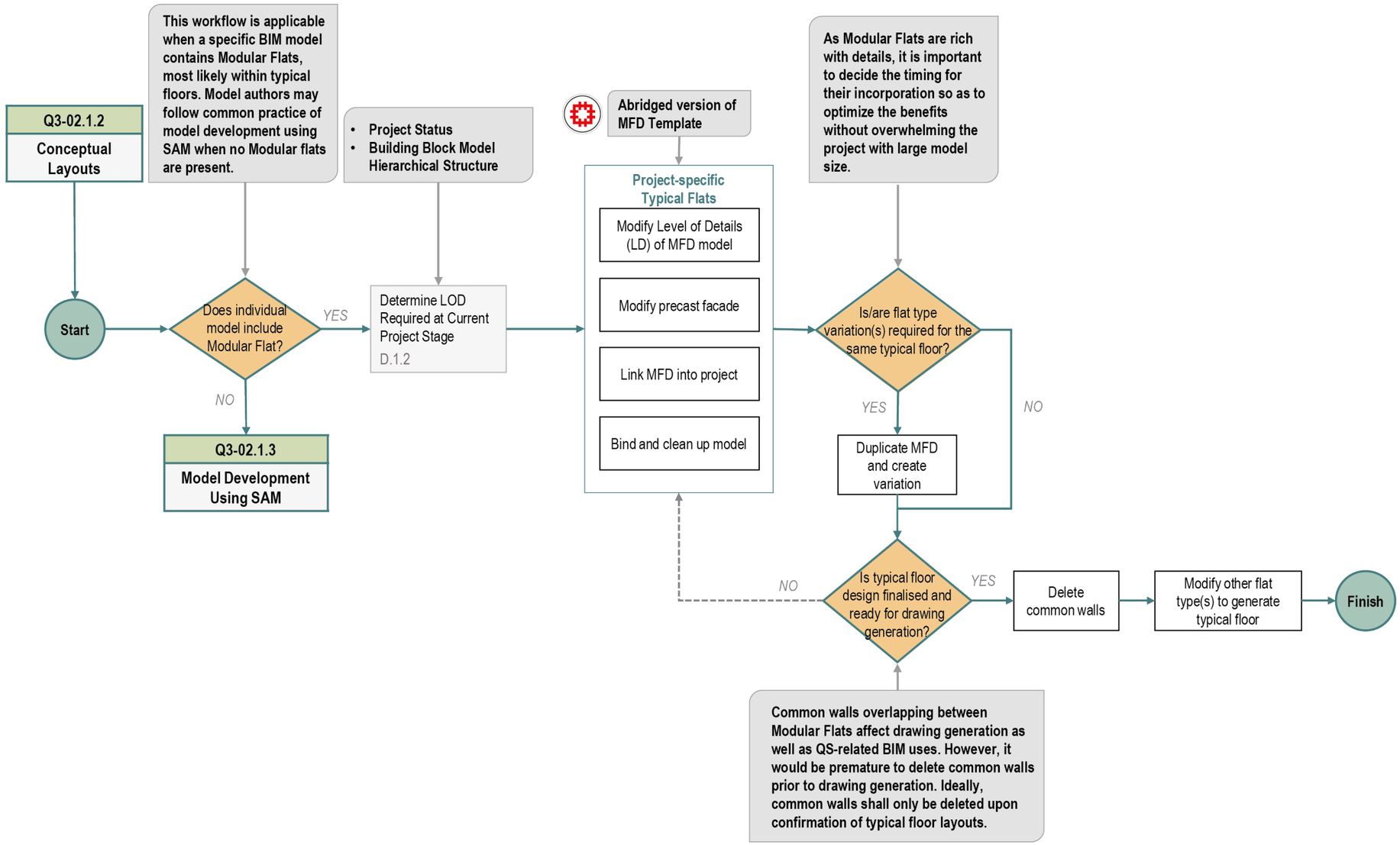
This workflow is applicable when a specific BIM model contains Modular Flats, most likely within typical floors. Model authors may follow common practice of model development using SAM when no Modular flats are present.

Is/are flat type variation(s) required for the same typical floor?

As Modular Flats are rich with details, it is important to decide the timing for their incorporation so as to optimize the benefits without overwhelming the project with large model size.

Is typical floor design finalised and ready for drawing generation?

Common walls overlapping between Modular Flats affect drawing generation as well as QS-related BIM uses. However, it would be premature to delete common walls prior to drawing generation. Ideally, common walls shall only be deleted upon confirmation of typical floor layouts.



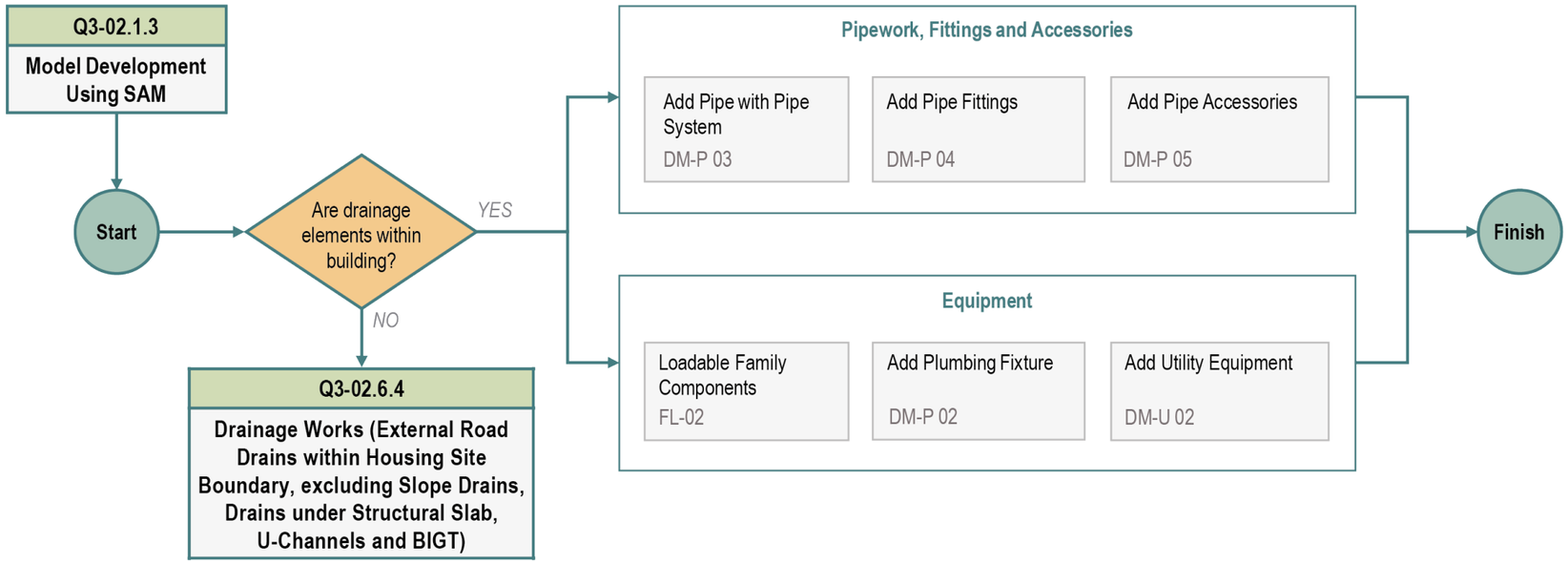
Q3-02.1.5 Drainage within Building

Are drainage elements within building?

If the drainage elements are located within building envelope (inside building footprint and above lowest structural slab), they belong to architectural discipline's modelling scope.

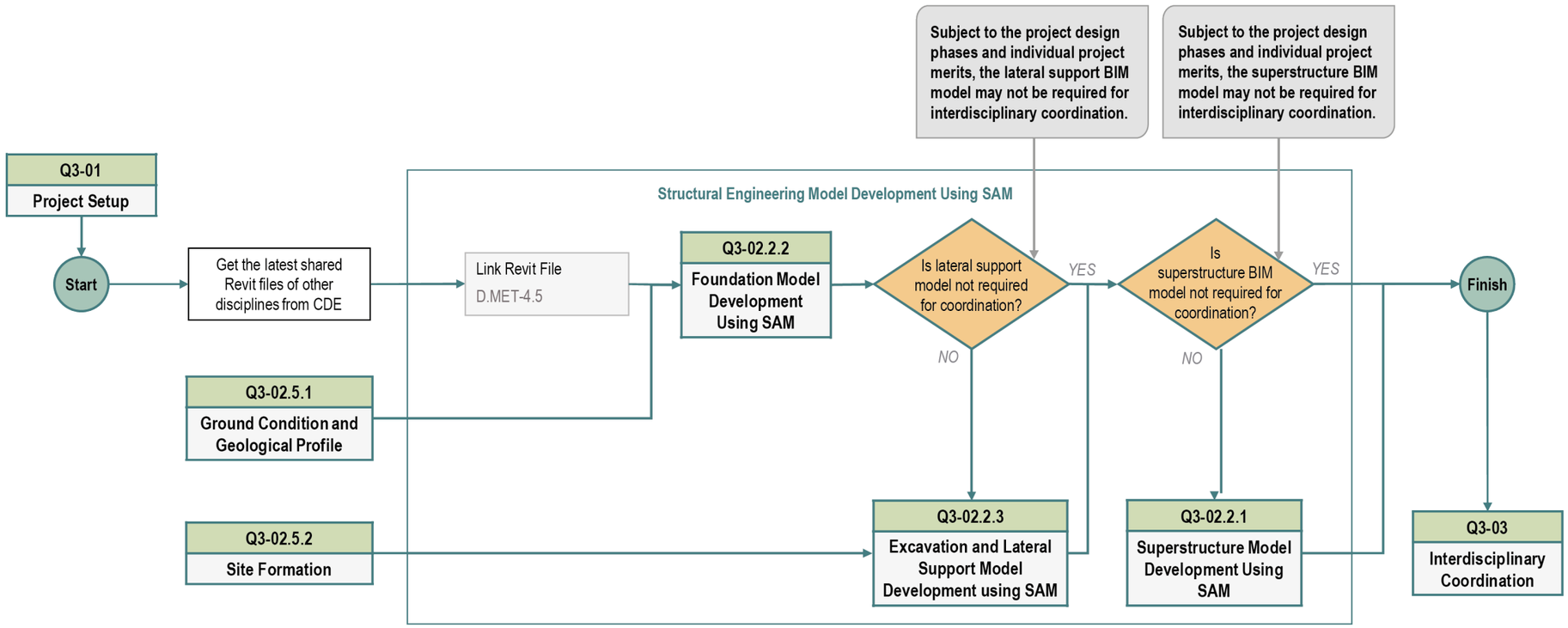
Otherwise, they belong to Workflow **Q3-02.6.4 Drainage Works (Road Drains within Housing Site Boundary, excluding Drains under Structural Slab and U-Channels)** within Civil Engineering (CE) discipline.

It is also worth noting that, while **DM-D01** and **DM-D02** separately refer to pipe work and drainage equipment, these SAM sections also refer back to **DM-P01** through **DM-P05** for detailed modelling methods.



Q3-02.2 Structural Engineering (SE) Modelling

Structural engineering team shall link the shared BIM models of other disciplines from the CDE and continue to fabricate all the structural elements of the structure BIM models based on the Standard Approach to Modelling (SAM). Upon approval by the Discipline Coordinator, the structure BIM models are ready for interdisciplinary coordination.



Q3-02.2.1 Superstructure Model Development using SAM

Before preparing superstructural BIM model, structural engineers should always ensure their BIM model could align with the latest building layouts as devised by Architects. The superstructural BIM model should be used to coordinate and collaborate with Architect and structural engineers shall determine the shape and size of the elements promptly in the BIM models.

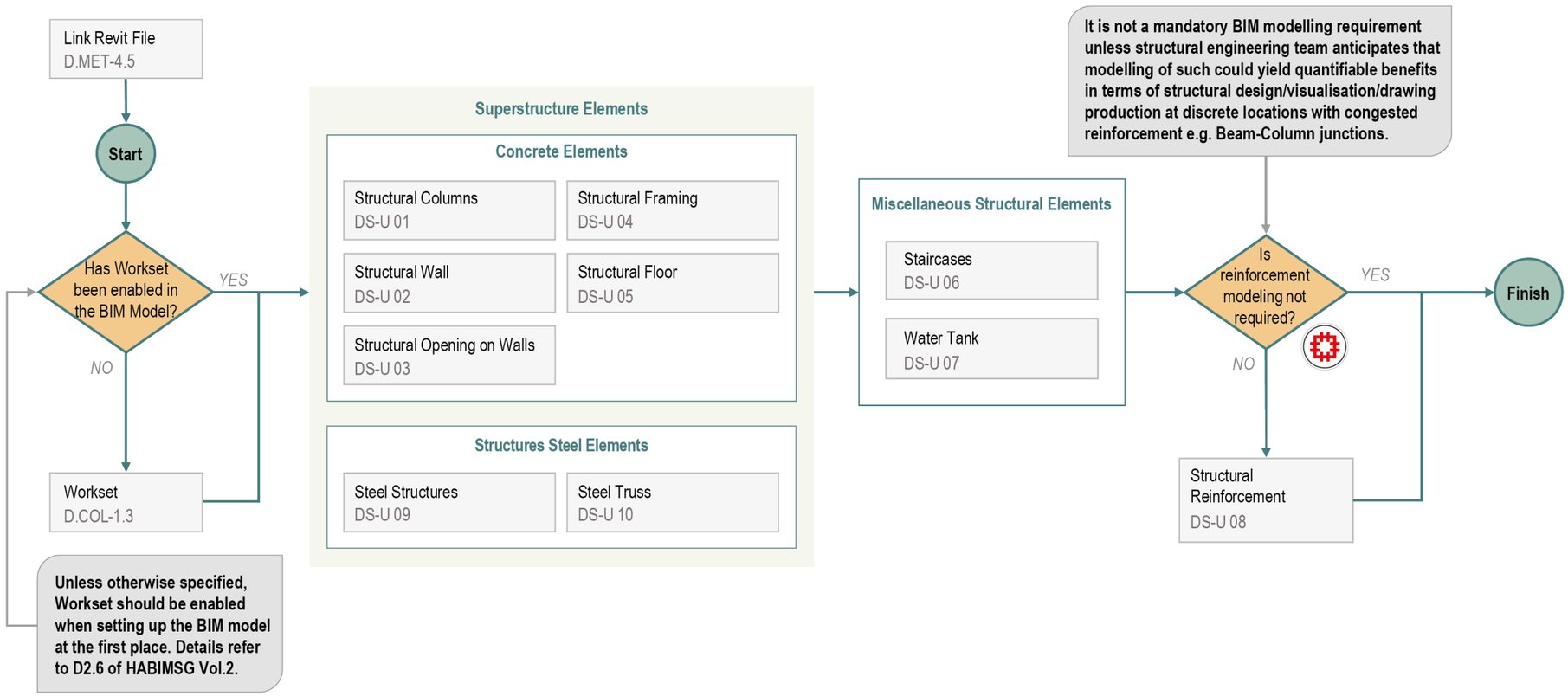
Structural engineers shall make use of the latest shared MEP BIM model from BSE to identify the location and openings that are required and advise the project BSE timely if such routing severely affecting the structural integrity.

Has Workset been enabled in the BIM Model?

Unless otherwise specified, Workset should be enabled when setting up the BIM model at the first place. Details refer to **D2.6** of HABIMSG Vol.2.

Is reinforcement modelling not required?

It is not a mandatory BIM modelling requirement unless structural engineering team anticipates that modelling of such could yield quantifiable benefits in terms of structural design/ visualisation/ drawing production at discrete locations with congested reinforcement e.g. Beam-Column junctions.



Q3-02.2.2 Foundation Model Development using SAM

Structural engineers shall obtain the latest shared BIM models from other disciplines to obtain following information for preparation of foundation BIM model:

1. Building layout plan from Architectural disciplines;
2. Underground geological profiles from Geotechnical disciplines;
3. Existing 3D site terrain model from Land Surveying Unit.

Structural engineers can subsequently design foundation elements (e.g. piles, footings, pile caps) with reference to these information.

HA SE section adopts the standard in-house foundation design workflow, i.e. BIM-enabled Systematic Approach to Foundation Design (BIM-SAFD), to develop the foundation BIM model.

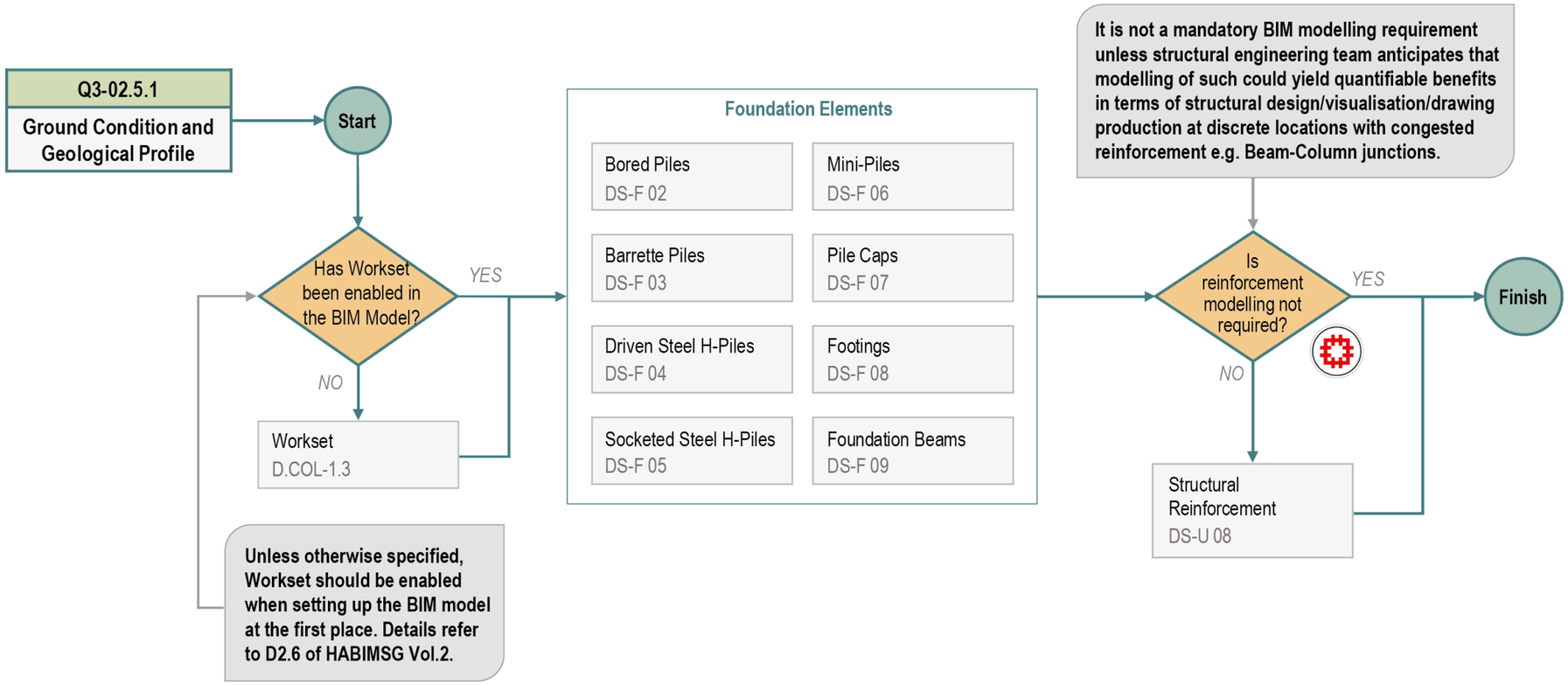
A foundation report shall be approved before the foundation BIM model is ready for interdisciplinary coordination and statutory submission.

Has Workset been enabled in the BIM Model?

Unless otherwise specified, Workset should be enabled when setting up the BIM model at the first place. Details refer to **D2.6** of HABIMSG Vol.2.

Is reinforcement modelling not required?

It is not a mandatory BIM modelling requirement unless structural engineering team anticipates that modelling of such could yield quantifiable benefits in terms of structural design/ visualisation/ drawing production at discrete locations with congested reinforcement e.g. Beam-Column junctions.



What is BIM-SAFD?

The Systematic Approach to Foundation Design (**SAFD**) is a foundation design workflow enabling project structural engineers to perform design coordination and collaboration under a Common Data Environment (CDE) and serving as a data-hub allowing data interoperability between different software and exchange of design data amongst design professionals. Upon finalization of the **SAFD**, the **SAFD** shall integrate with **BIM** by linking up the 3D Bedrock Contour and the "Revit" foundation model to arrive at the new BIM design approach the **BIM-SAFD**.

What is BIM-SAFD Workflow?

The workflow of BIM-SAFD consists of 2 stages.

Stage 1 : The Systematic Approach to Foundation Design (SAFD)
The basic skeleton of SAFD is the integrated use of Surfer (a full-function 3D visualization, contouring and surface modelling software) and Excel Workbook to generate the necessary pile design information based on the available ground investigation information.

Stage 2 : The Generation of Foundation BIM Model (BIM)
The generation of the foundation BIM model involves the following professional disciplines.
(i) Land Surveyor offers the actual site topography and adjacent ground conditions for incorporation into the BIM model;
(ii) GE offers the 3D underground bedrock contour (Surfer's GRD file) and GI logs image (Voxler's AGS file) based on the Ground Investigation data;
(iii) BIMST offers the Standard Approach to Modelling (SAM), model templates and foundation objects with shared parameters and attributes;
(iv) SE builds up the foundation BIM model and incorporates the pile design data and available ground investigation information into the BIM model

What is the steps for BIM-SAFD?

Step 1 : Upon completion of the foundation analysis, SE goes through the design processes by adopting the SAFD. A foundation report consisting of the necessary foundation design information is to be generated for design verification and validation.

Step 2 : Upon completion of the foundation design, PSE integrates the SAFD with BIM by linking up the 3D Bedrock Contour and site topography to form a data-rich 3D foundation model for design visualization and clash detection;

Step 3 : Prior to the ICU submission, PSE seeks PCSE's approval of the design submission by using the SAFD Report + 3D BIM model to demonstrate that the design is in compliance with HD's design practice and Code requirement. The 2D foundation drawings shall then be generated from the 3D BIM model for ICU submission.

Step 4 : The finalized foundation BIM model shall be used for foundation tender. Upon commencement of the foundation contract, PSE shall forward the design foundation BIM model to the Foundation Contractor for developing the as-constructed foundation BIM model.

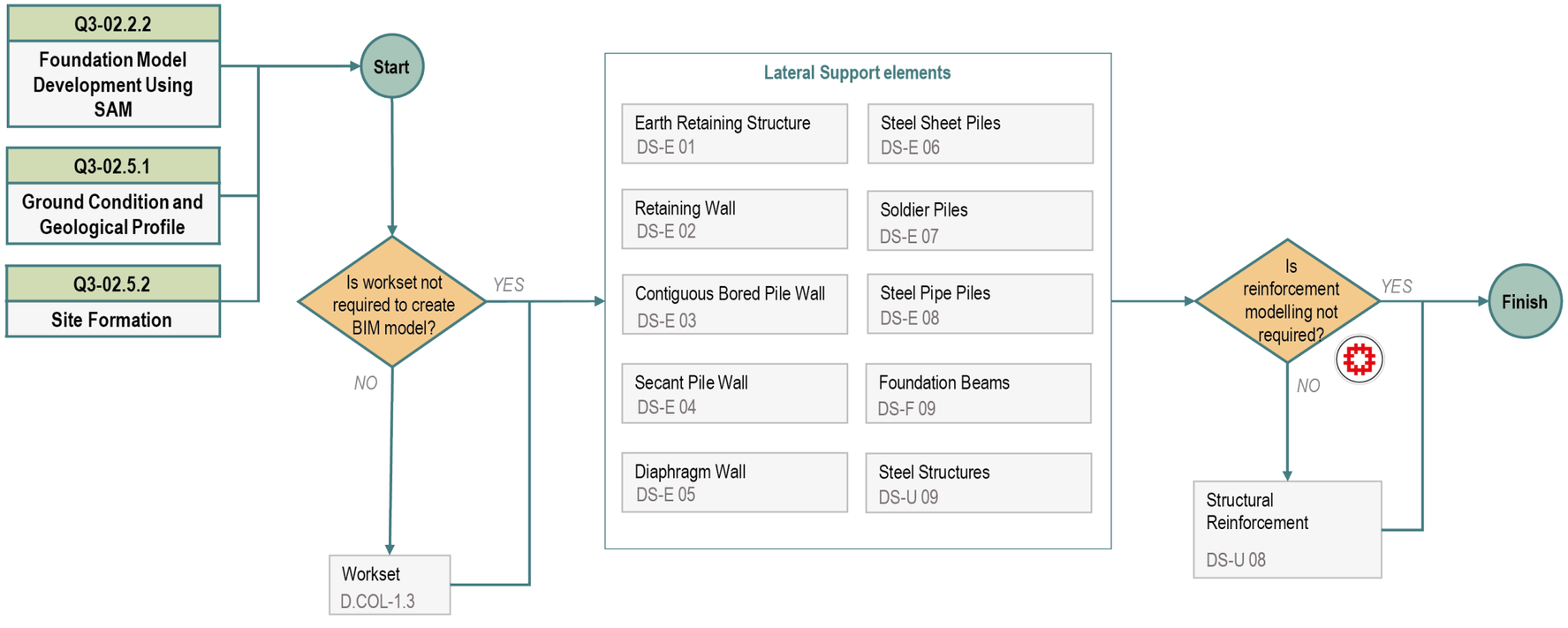
Q3-02.2.3 Excavation and Lateral Support Model Development using SAM

When a reference engineer design for excavation and lateral support (ELSW) is required, structural engineers could prepare the lateral support BIM model with reference to the latest version of foundation BIM model. Structural engineers could put the shoring, waling and king-post in the lateral support model and position these members without clashing the foundation elements.

To suit individual project merits, structural engineers may also design the phasing for excavation and lateral support works, which could significantly increase the efficiency for estimating the amount of cut-and-fill volume of the propose ELSW design.

Has Workset been enabled in the BIM Model?

Unless otherwise specified, Workset should be enabled when setting up the BIM model at the first place. Details refer to **D2.6** of HABIMSG Vol.2.



Q3-02.3 Building Services Engineering (BSE) Modelling

As there are numerous Building Services (BS) elements in every building, the BIM model for BS installations can be simplified with only large BS elements incorporated to optimize the modelling process and make good use of computer resources. Examples of large BS elements are listed below for reference and recommended to be included in BIM Model

- ACMV equipment (chillers, cooling towers, AHUs, FCUs, ventilation fans, etc.), air ducts and water pipes.
- All water pumps, PRV sets, meters, water pipes and valves
- LVSB, MCCB Boards, MCB Boards, busbar chambers, switch disconnectors, control panels
- Trunking and cable trays (excluding cables), switches, sockets, lighting fittings, meters
- Emergency generator, fuel tank, Chimney
- Hose reel, fire hydrant, fire alarm bell, break glass unit, FS Control panel, Sprinkler, Sprinkler control valve set.
- Lifts landing doors, escalators, Motors (inside LMR)

Model authors may include additional elements other than the above examples as required for generating layout, section or elevation drawings to suit the project's need.

Model authors shall pay attention to the Level of Development - Graphics (LOD-G) of the BS objects and avoid using BS objects with excessive LOD-G in the design model. It is preferable to focus on the information of the object for future use in asset management rather than the detailing. BIM model with excessive elements and unnecessary details will lower modelling efficiency and affect the performance of the computer hardware.

To prepare for building services engineering modelling, Revit Template with correct MEP setting (such as mechanical duct, pipe setting and electrical setting) shall be checked and aligned with the content as mentioned in General Notes of each drawing set.

Get the latest shared models from architectural and structural disciplines and check for the model project base point and survey point (origin).

Is Revit Reference Analysis Required?

Analyses by Revit include:

i) Heating and Cooling load analysis

ii) Lighting analysis on Average Estimated Illuminance

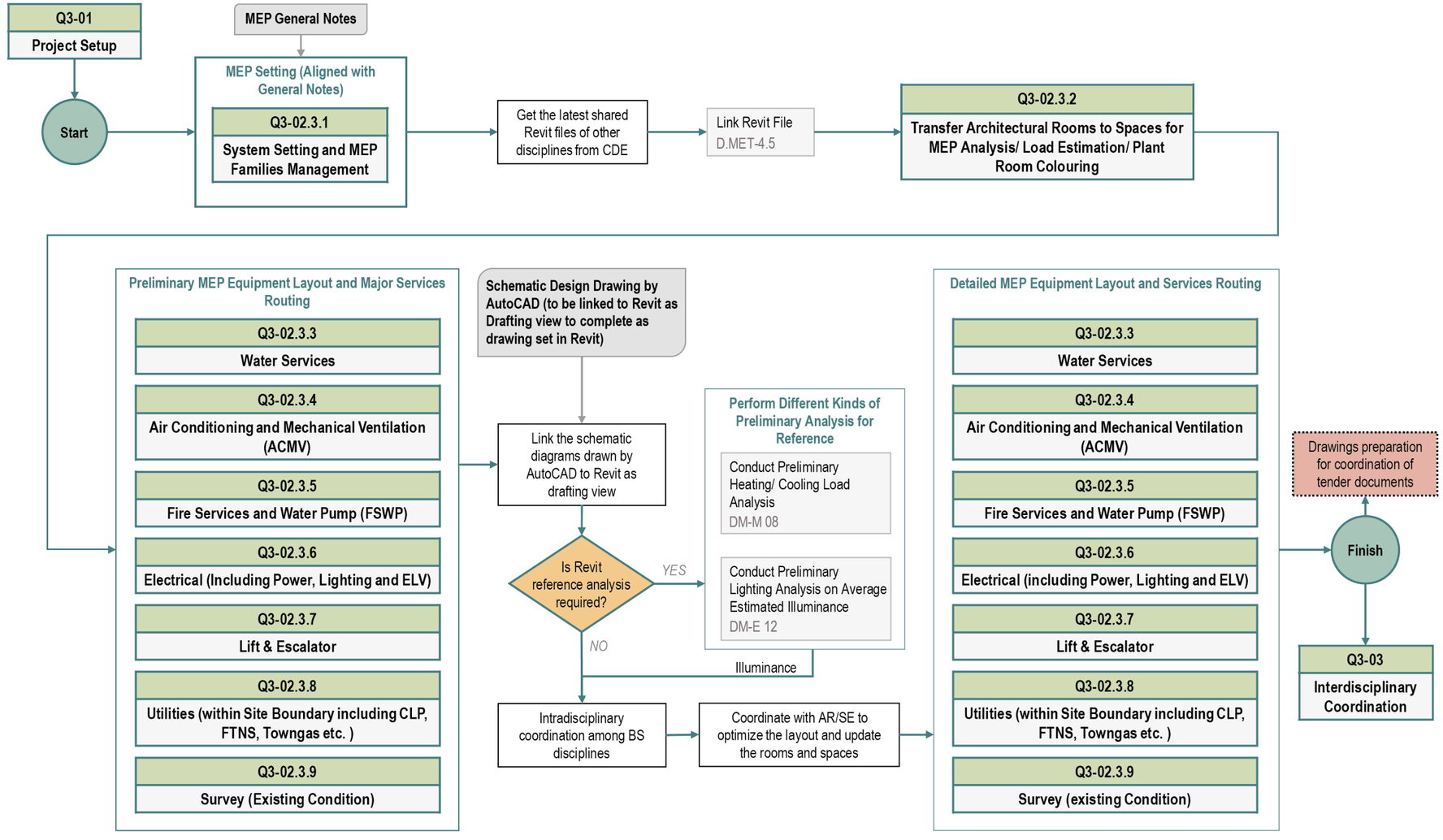
Detail workflow of conducting these analyses can be found in **D4.9 DM-M 08** of HABIMSG Vol.2**.**

Once the preliminary calculation is completed, planning of equipment layout can be started in Revit. Major services routing can then be followed to model based on the equipment layout.

Preliminary calculation is for reference only and is not the prerequisite for schematic design. It may help the subsequent detailed MEP design.

Before starting detailed services layout, intradisciplinary coordination among BS disciplines shall be conducted. After completing detailed services routing and equipment layout, interdisciplinary coordination may follow.

The output from BIM can be further used to prepare drawings for coordination of tender documents.

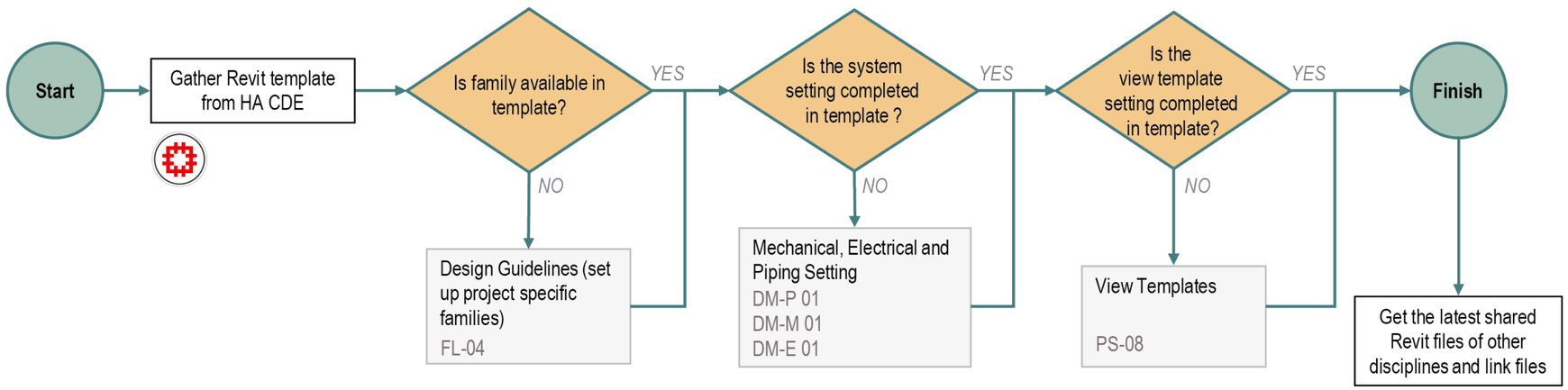


Q3-02.3.1 System Setting and MEP Families Management

This procedure is to make sure that the Revit Template used to develop building services engineering model fulfils the modelling requirements under BS scope as mentioned in **Q3-02.3 Building Services Engineering (BSE) Modelling**.

Project Model Templates can be found in the locations as indicated in the **Annex** of this Guide

Model authors shall check the latest project template as to whether it is suitable for modelling. If not, a project specific template to suit project requirements would be needed.



Are Family, System Setting and View Templates available to proceed with Building Services Engineering Model?

There are three areas for checking.

a. Project Specific Families-If Revit Families as mentioned in detail guide are not available (such as **DM-F 02** for Water Pump), then these families need to be created with reference to **FL-04**.
b. Mechanical, Electrical and Piping Setting-Refer to **DM-P 01, DM-M 01** and **DM-E 01** to check the settings on size and type for pipe, duct and electrical containment. Energy setting can be found in **DM-M 08** for Preliminary Heating/ Cooling Load Analysis.
c. System View Template is mainly used for individual view presentation and drawing production-Pre-defined View Templates can standardize presentation style and save time on setting up for each project. Details on project specific setting can be referred to **PS-08**.

Q3-02.3.2 Transfer Architectural Rooms to Spaces for MEP Analysis/ Load Estimation/ Plant Room Colouring

Building Services Engineering modelling relies on the base model of Architectural model and Structural Engineering model and requires the "Room" information from architectural model.

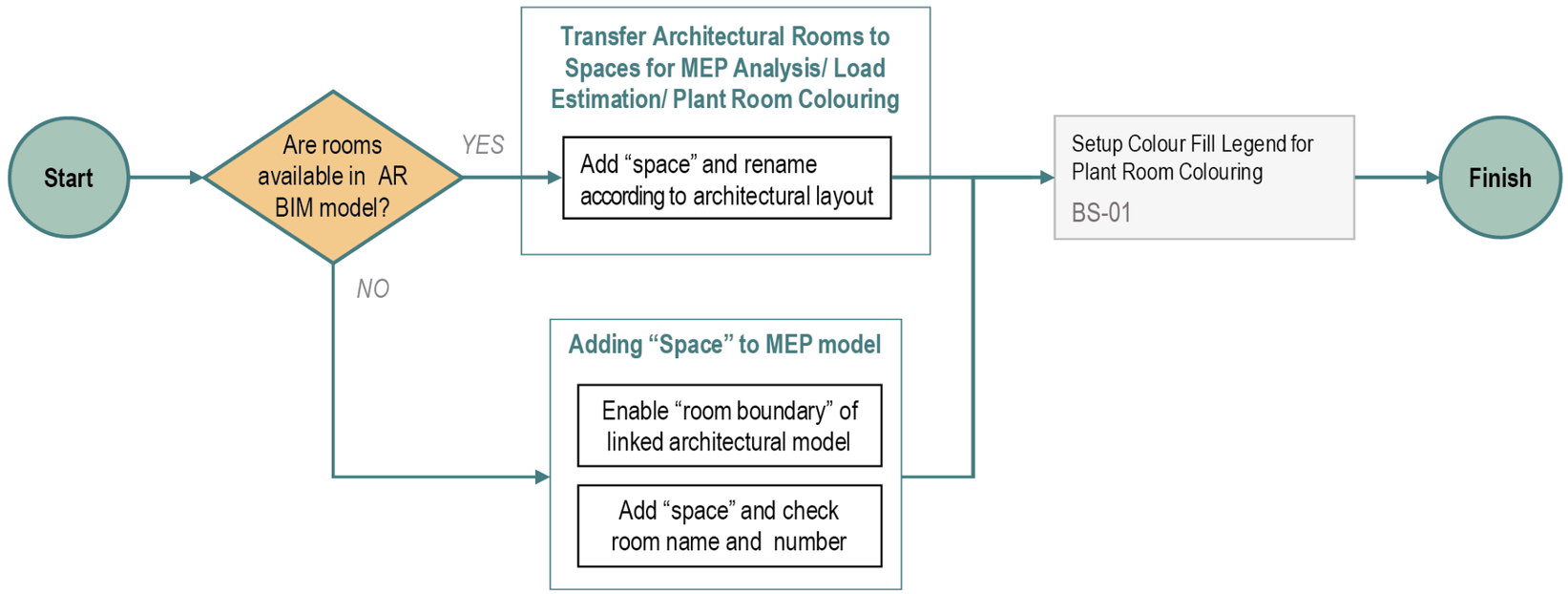
Are Rooms available in Architectural (AR) BIM model?

"Rooms" in architectural model can be easily transferred to Building Services Engineering model as "Spaces" for analysis purpose and preparing plant room colouring plan.

Transfer Rooms in architectural model as "Space" in Building Services Engineering model. If Rooms do not exist in architectural model, add "Space" manually based on the Room name and number from architectural drawings.

Colour Fill Legend may be applied for plant room colouring, which can highlight and group space to different kinds of scheme by parameters. Detail guide on using "Colour Fill Legend" for Plant Room Colouring can be found in **BS-01**.

"Space" is an object dedicated for various analyses. The analyses can be conducted according to project requirements.



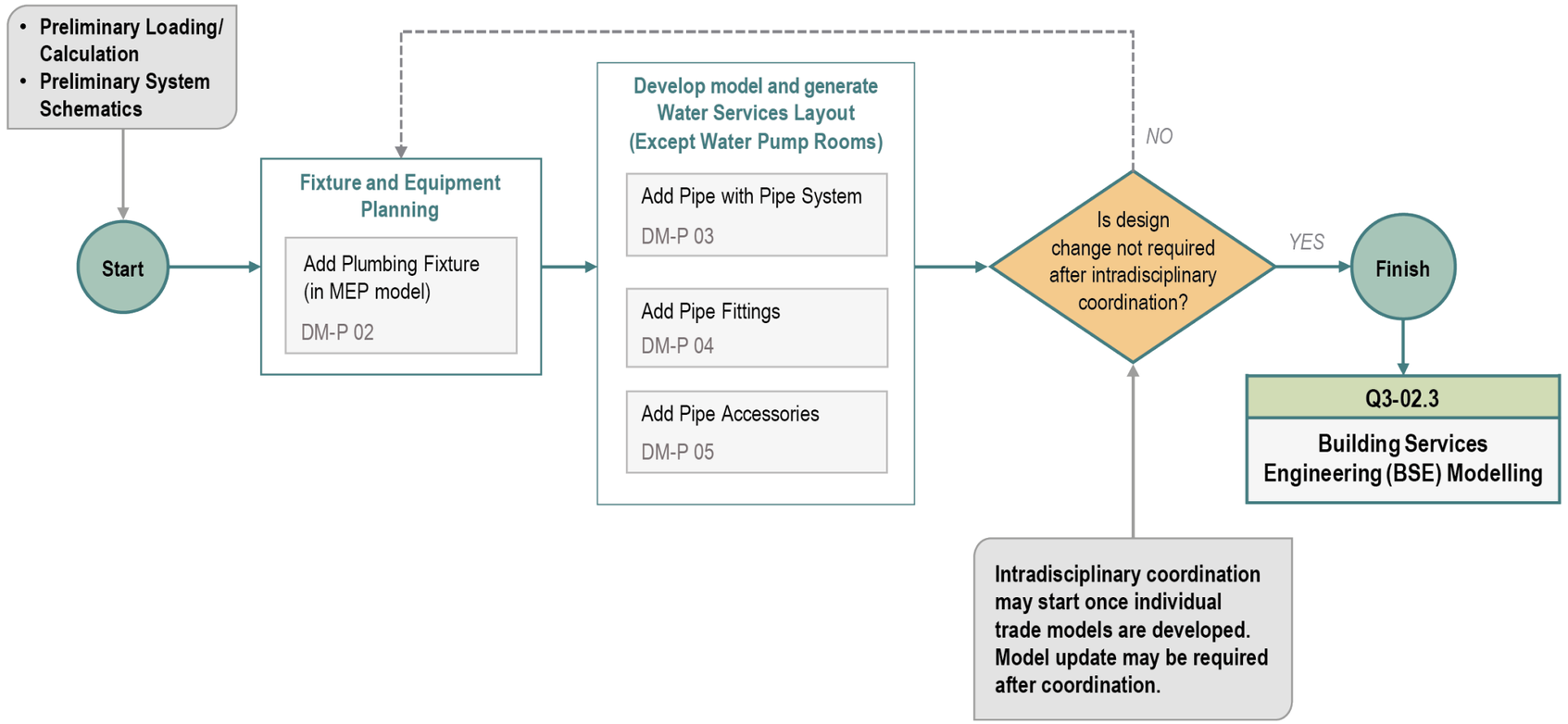
Q3-02.3.3 Water Services

Before starting model authoring process, preliminary calculation and schematic design shall be prepared for further planning of services layout development.

This Water Services workflow illustrates on how to use Revit to build a MEP model for water services installation. Method for editing the pipe setting can be found in **DM-P 01** if additional pipe size or type is needed to be added into model file. According to BS design workflow, plumbing fixtures can be added to MEP model first.

DM-P 03 to 05 illustrate the basic skill in using Revit on modelling water pipe, pipe fittings and pipe accessories. As Revit utilizes system concept when developing piping layout, **DM-P 03** also illustrates the system concept which forms the basis for both model and drawing preparation.

The intra-coordinated model can be used for further steps as shown in **Q3-02.3** for linking schematic drawings, proceeding analysis and coordination with other disciplines for detailed design.

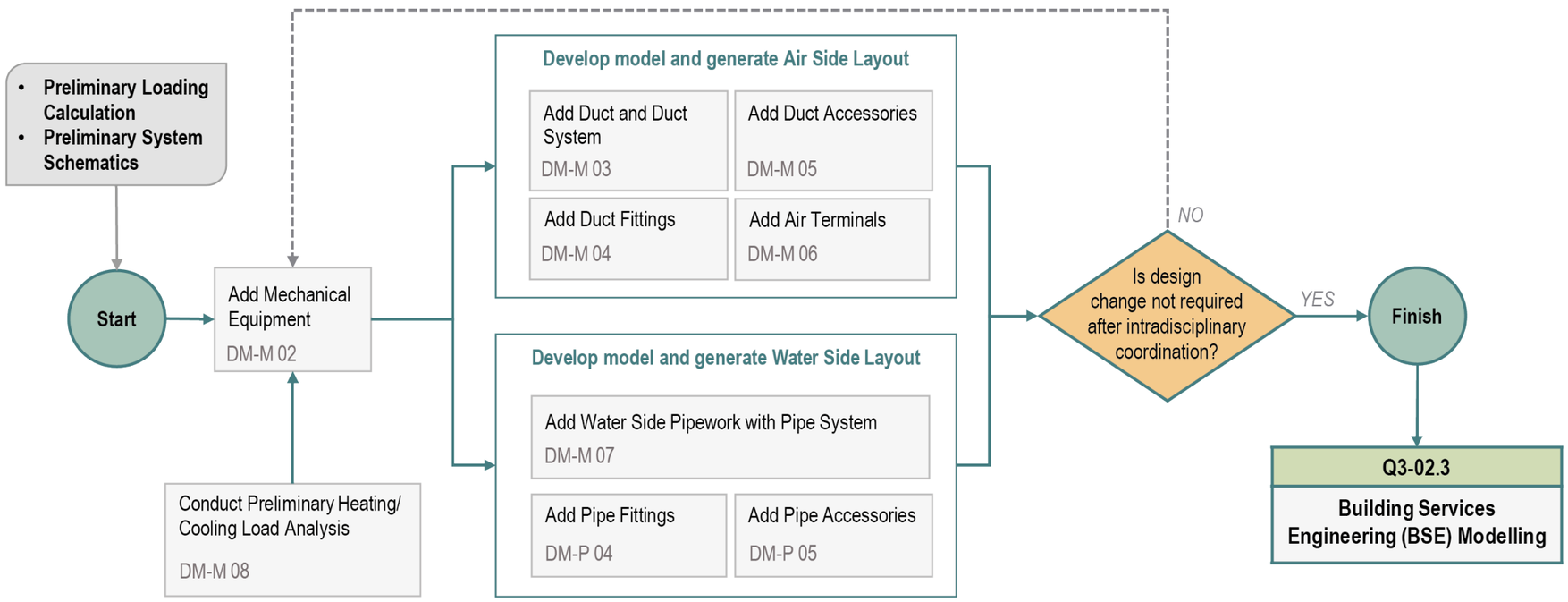


Q3-02.3.4 Air Conditioning and Mechanical Ventilation (ACMV)

Method for editing the mechanical setting can be found in **DM-M 01** if additional information on duct size or type is needed to be added into the model file.

ACMV design and modelling workflow starts from adding mechanical equipment and conducting preliminary heating/ cooling load analysis.

ACMV trade design and model development in Revit are further divided into air side and water side. Preliminary equipment and main routing shall be first developed for initial planning. Detailed design elements may be further developed by referring to **DM-M 03 to DM-M 06** for air side, and **DM-M 07, DM-P 04, DM-P 05** for water side.



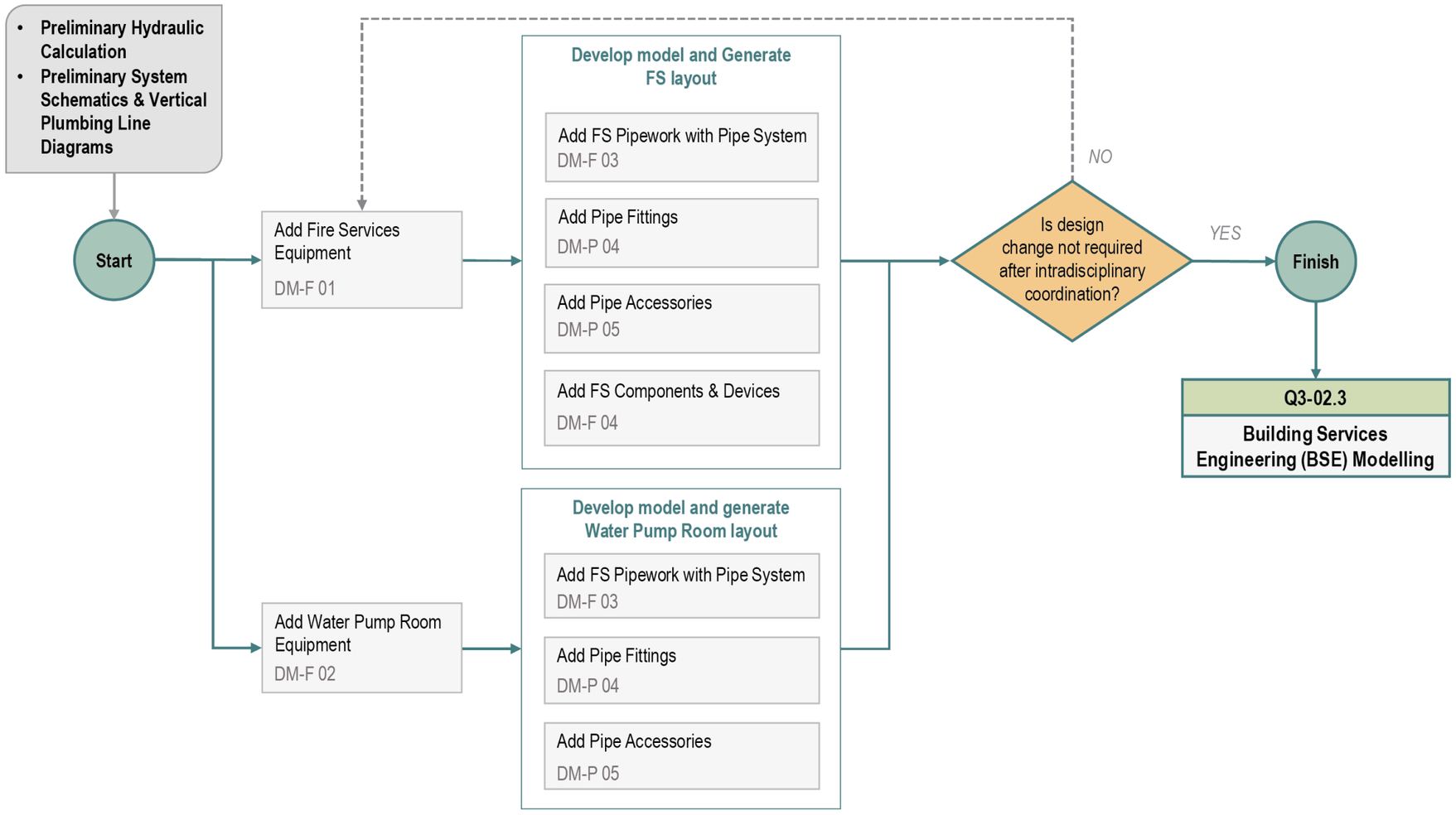
Q3-02.3.5 Fire Services and Water Pump (FSWP)

FSWP trade design and model development include water pump and pump room layout.

After preparing preliminary hydraulic calculation and system schematics & vertical plumbing line diagrams, FS equipment and water pump room equipment may be added for preliminary equipment and layout planning. Detailed guide on FS pipework layout is similar to Water Services (**Q3-02.3.3** Water Services refers).

Refer to **DM-P 04** and **DM-P 05** for modelling methodology for pipe fittings and accessories, and **DM-F03** for developing the major and detailed service routing of FS specific pipe system.

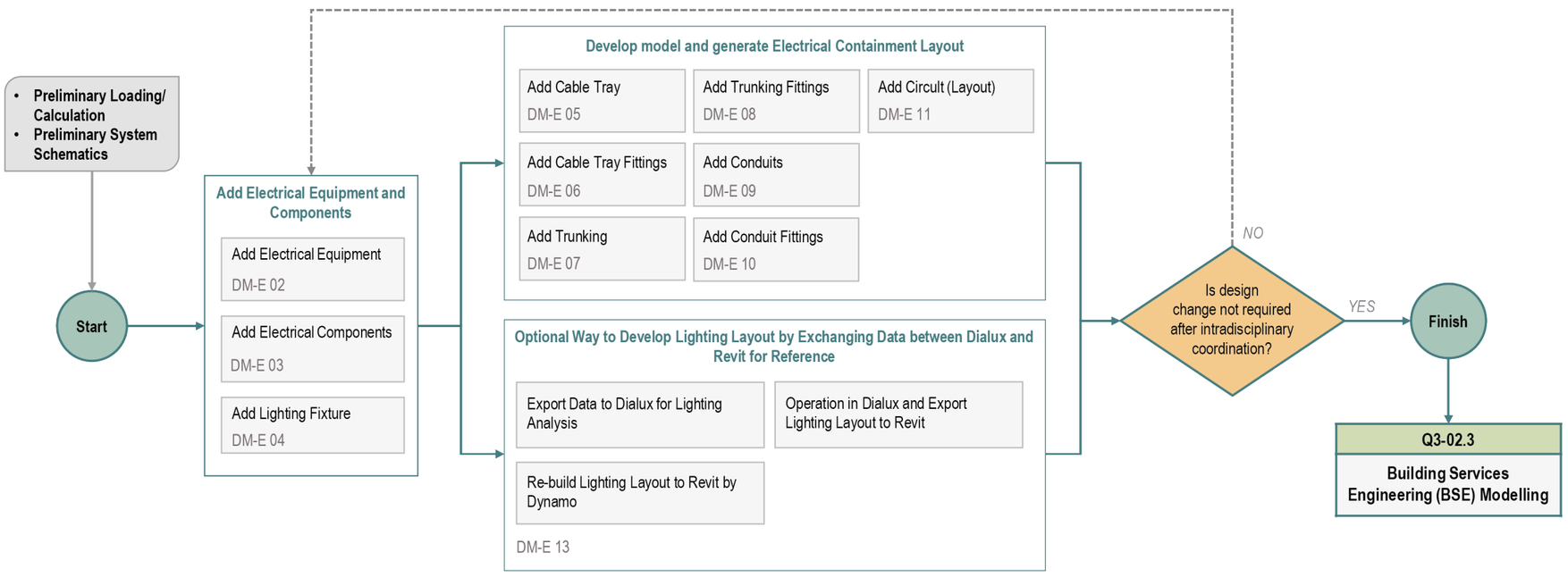
For model authoring detail guide in respect of other FS devices and installation including manual call point, alarm bell, sprinklers and detectors, refer to **DM-F 04**.



Q3-02.3.6 Electrical (Including Power, Lighting and ELV)

Electrical trade design and model development includes Power, Lighting, ELV and PV system. Refer to **DM-E 02 to 04,** modelling methodology for preliminary equipment, components (including switches, PV system, CCTV and etc) and lighting fixture. Refer to **DM-E 05 to DM-E 11** for detail guide for electrical containment layout including cable tray, trunking, conduit and circuit.

In most cases, only major routing of cable tray and trunking is required to be modelled in Electrical model while small conduit is not required.



Q3-02.3.7 Lift and Escalator

Most HA project only require lift landing doors of the lifts in the buildings or lift towers and escalators in non-domestic premises to be modelled in design stage. Large elements such as panel and motors in lift machine room are recommended to be modelled for the purpose of reviewing the maintenance access, while the detailed layout of lift machine room may be further developed by Lift and Escalator NSC.

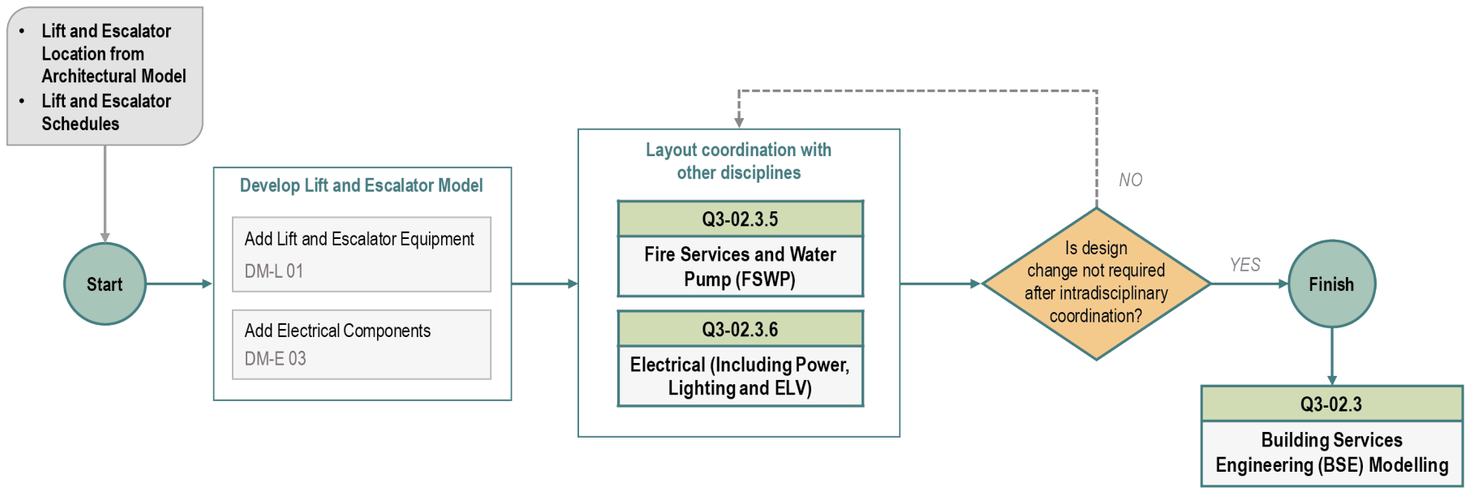
In other words, Lift and Escalator BIM model contains:

- Lift landing doors on each landing floor.
- Escalators for non-domestic premises.
- Major electrical and mechanical components such as panel and motor in lift machine room.

Detailed lift decoration is not required in Lift and Escalator BIM model.

The Lift and Escalator location will be proposed by the architectural teams. The lift and escalator schedules then be prepared and verified by Building Service engineering team.

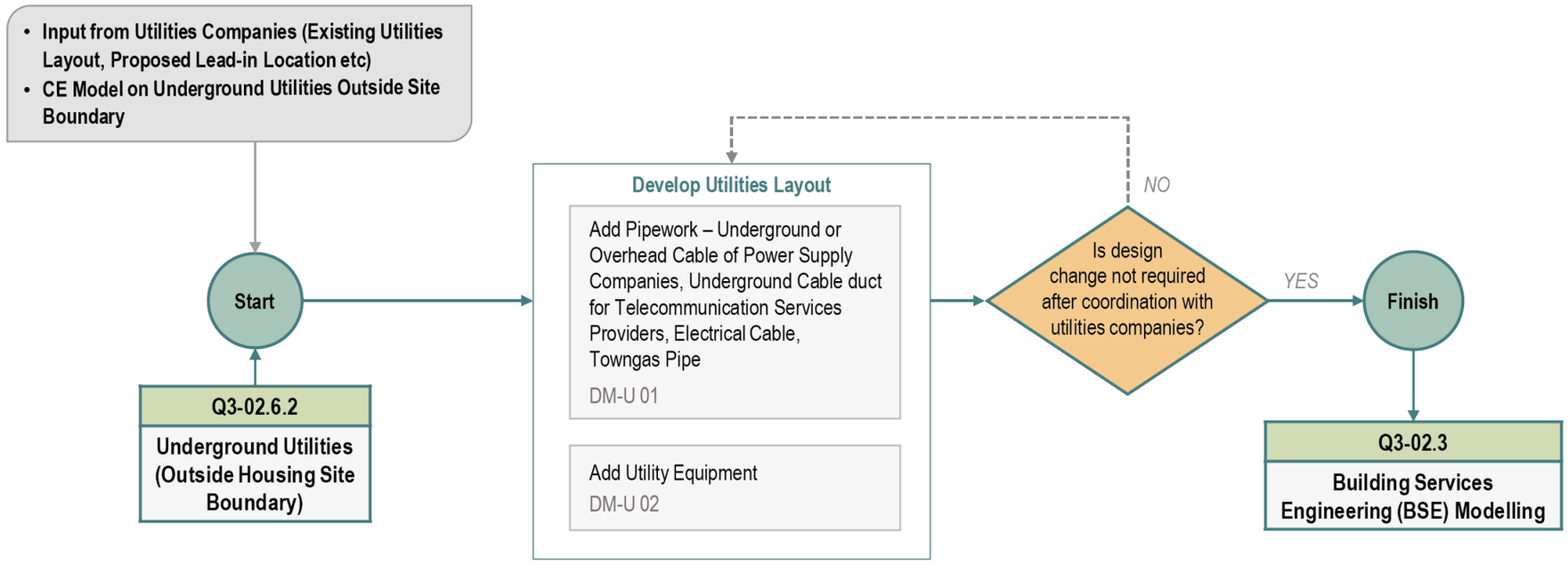
As signal interfacing is required between Lift and Escalator Installations and Electrical and Fire Services Installations, coordination between the above disciplines on the service routing design should be conducted.



Q3-02.3.8 Utilities (Within Site Boundary including Power Supply Companies, FTNS, Towngas etc.)

Modelling of underground utilities within site boundary requires information from utilities companies which will be further coordinated with BSE models. It shall include Power Supply Companies, FTNS and Towngas etc. Utilities model includes pipework (**DM-U 01**) and utility equipment (**DM-U 02**) which includes the manhole and draw-pit for connecting pipework.

For workflow of underground utilities outside site boundary, refer to **Q3-02.6.2**



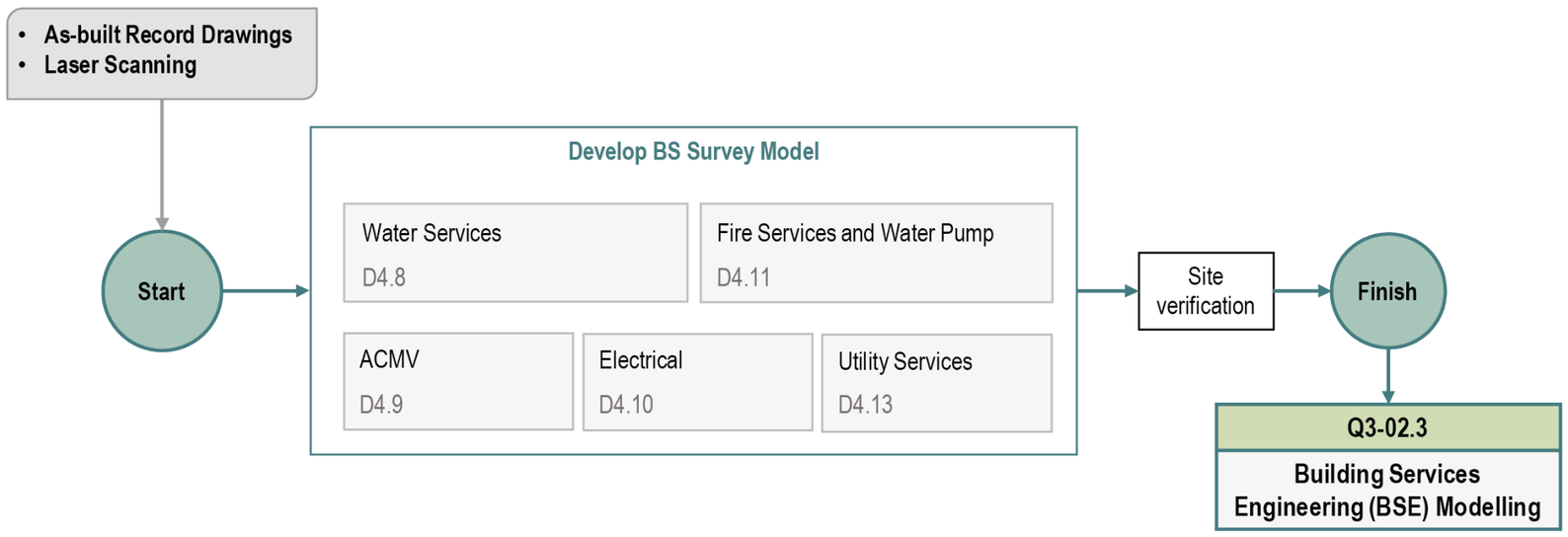
Q3-02.3.9 Survey (Existing Condition)

BS survey model shall be developed when design coordination between new design elements and existing BS elements is required.

The survey model may be prepared either by laser scanning or based on as-built record drawings.

Once the survey model has been developed, site verification should be conducted to ensure its accuracy.

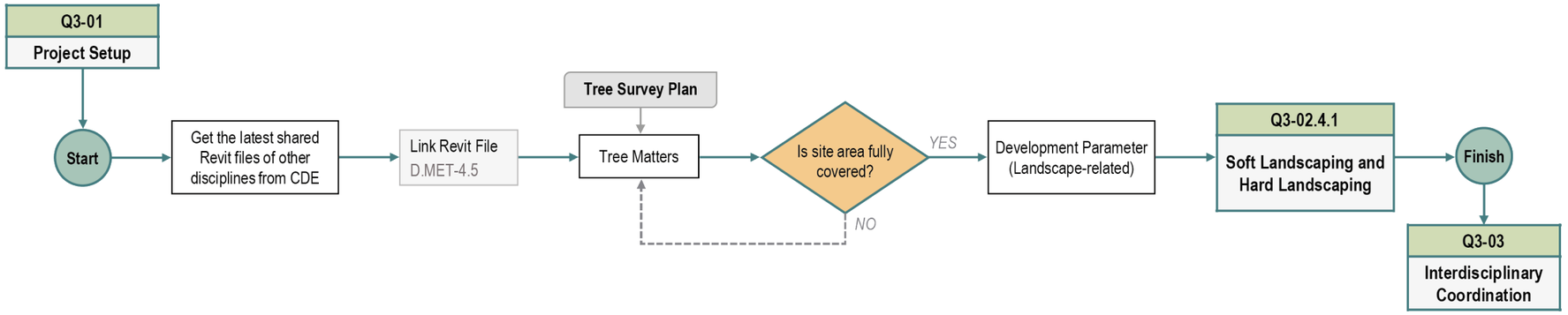
To develop BS survey model, refer to detail guide of individual trades as shown in the workflow.



Q3-02.4 Landscape (LA) Modelling

In general, Landscape (LA) Modelling involves works on tree matters, development parameter (landscaped-related), soft landscaping and hard landscaping.

Prior to starting landscape modelling, it is preferable that available building and civil models be linked to cross-check and confirm landscape design boundaries.



Q3-02.4.1 Soft Landscaping and Hard Landscaping

Upon obtaining tree survey plan and other disciplines' models as the basis for reference, soft landscape and hard landscape may be modelled in parallel.

Are there significant topographic variations outside building footprint?

Topographic variation affects level of difficulty of modelling landscape elements. The severity of topography affects the recommended modelling approaches. For steeper surface (over 15% slope in general) with more variations, "Toposurface" is recommended. For smoother surface (less than 15% slope), alternative families such as Floor may be used. In either case, correct materials shall be set and applied.

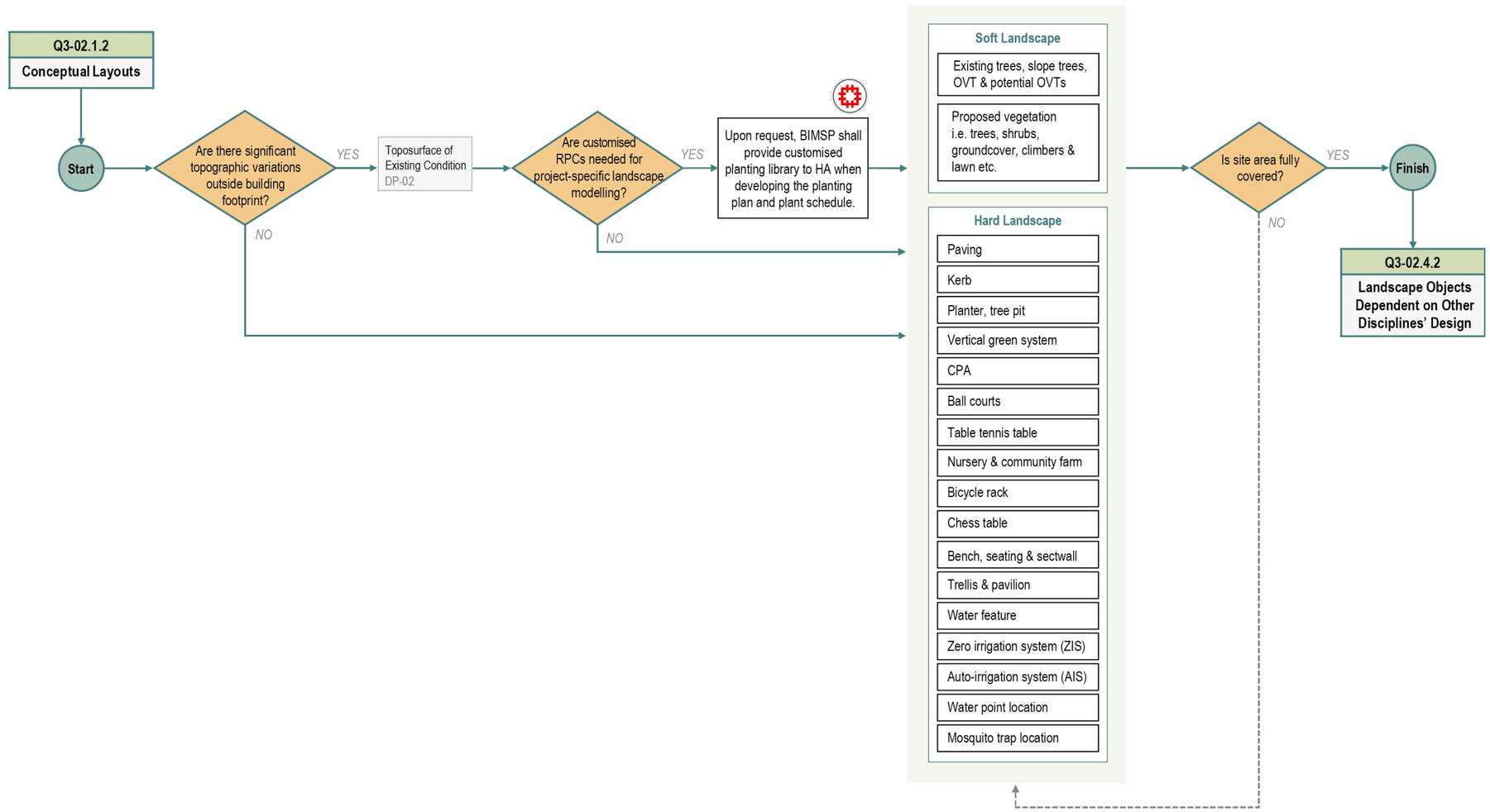
Are customised RPCs needed for project-specific landscape modelling?

RPCs (Rich Photorealistic Content) for Revit objects under planting category are included in existing built-in Revit planting library for their Render Appearance.

Upon request, BIMSP shall provide customised planting library to HA when developing the planting plan and plant schedule.

Is site area fully covered?

After modelling hard landscape and soft landscape, it is essential to ensure full site coverage prior to proceeding to landscape objects dependent on other disciplines' design.



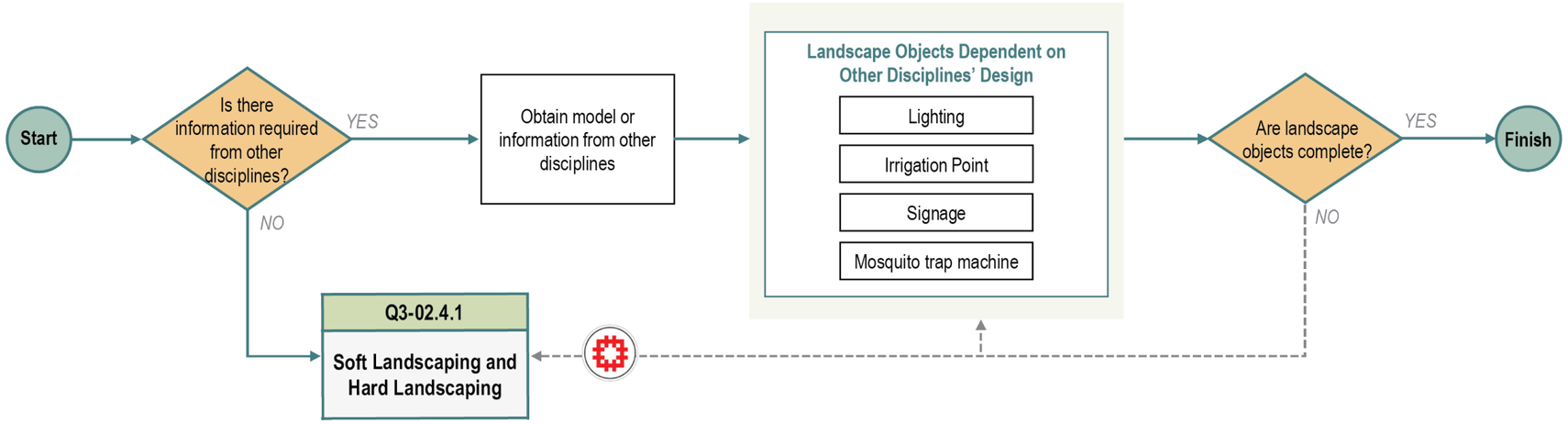
Q3-02.4.2 Landscape Objects Dependent on Other Disciplines' Design

Is there information required from other disciplines?

Some objects that exists in open space may be designed by other disciplines, especially when engineering or code implications are involved. For example, signage, irrigation points and lighting are oftentimes designed by other disciplines.

Are landscape features / furniture completed?

Completeness of landscape model affects other disciplines' designs, especially BS and CE, and QS' use of BIM model.



Q3-02.5 Geotechnical Engineering (GE) Modelling

The first step is to determine which BIM software is to be used for GE elements modelling.

Detailed BIM software uses shall be planned ahead and well-specified in project-specific PxP.

Revit is good to coordinate and collaborate with other disciplines with sample file format. However, Revit can only create geotechnical element models by manually inputting fixed design data, but it may not be an efficient modelling tool for some elements such as rockhead, slope, drill hole stick, etc. For these elements, Civil 3D is a more effective BIM software.

Civil 3D is a design authoring tool which contains many intelligent features for geotechnical elements design and modelling. For example it can help engineer in berm arrangement and calculating the slope boundary by inputting slope parameters (slope gradient, max. berm height, berm width…). It can also help engineers to automatically create curved longitudinal profile views for design review.

For some repetitive elements, they can be created in either Revit or other software.

It is necessary to select the appropriate BIM software for different elements based on BIM use purposes and software skill set of the team members.

Typical BIM software for GE elements are as below:

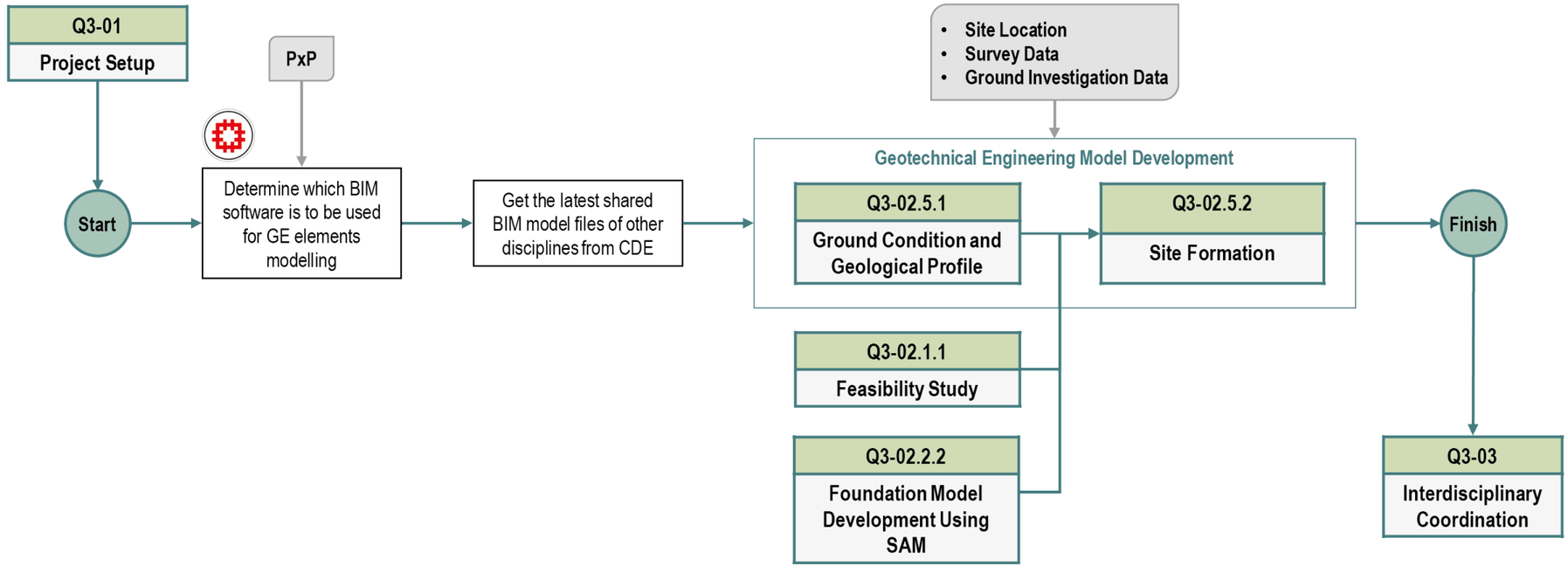
- Civil 3D is used for creation of bored hole sticks, slope and platform, site drain, retaining wall, cut and fill volume calculation, etc.
- Surfer is used for creation of rockhead which can be exported to Civil 3D or Revit
- Revit is used for creation of soil nails, permanent retaining structure and, etc.

Geotechnical engineering team can get the shared BIM models of other disciplines from the CDE and continue to develop the elements of the geotechnical BIM models based on the Standard Approach to Modelling (SAM).

Before conducting Geotechnical BIM modelling works, site boundary information, survey data, ground investigation data, base map, etc. should be collected for modelling.

When ground condition model and geological profile model are completed, it can be referenced for site formation design.

Upon approval by the Discipline Coordinator, the Geotechnical BIM model is ready for interdisciplinary coordination.

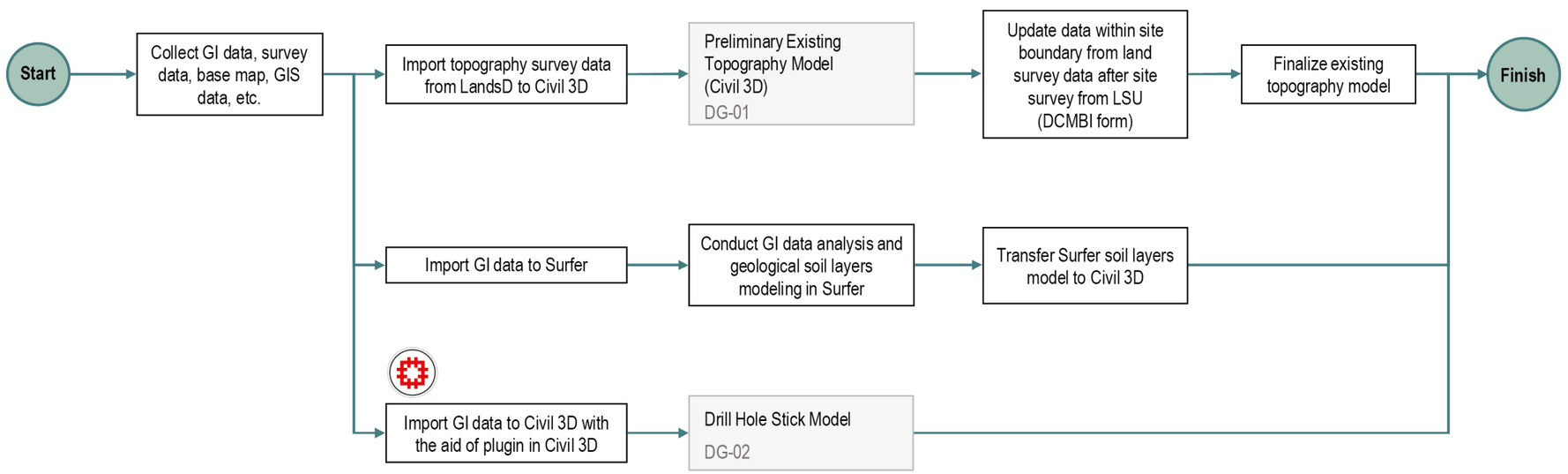


Q3-02.5.1 Ground Condition and Geological Profile

HA GE section mainly uses AutoCAD Civil 3D to develop the model including ground condition and geological profile models.

Reference data such as GI data, survey data, base map and GIS data should be collected as much as possible. The source survey data will be used to develop the preliminary existing topography model. Upon receiving the updated land survey data within site boundary from HA LSU, the existing topography model can be finalised.

GE uses Surfer to analyse geological profile and different soil / rock layer. Once the result is completed, dxf can be exported and imported to Civil 3D.



HA developed Excel Add-in sheet and plug-ins to facilitate GI drill hole stick modelling in Revit/Civil 3D respectively:

1. SE Section has developed the Excel Add-in sheet to assist Project Structural Engineers in using the software "Voxler" to generate 3D graphic of drill holes information from native GI digital data (AGS files) provided by the Project Geotechnical Engineer and subsequent export in 3D DXF format for import by Revit. Please refer to Foundation SAM (D4.5) at Volume 2 - Detail Guide for details.

2. GE Section has developed a plugin in AutoCAD Civil3D which can be further shared to other disciplines to visualise the drill hole stick.

SE could obtain the Grid file (*.grd) and Surfer file (*.srf) or in other compatible file formats, that containing the topography of founding stratum, from GE to determine the founding level of piles by using BIM-SAFD approach.

Q3-02.5.2 Site Formation

Once the ground condition, geological profile and foundation model are ready, site formation model may be prepared in Civil 3D.

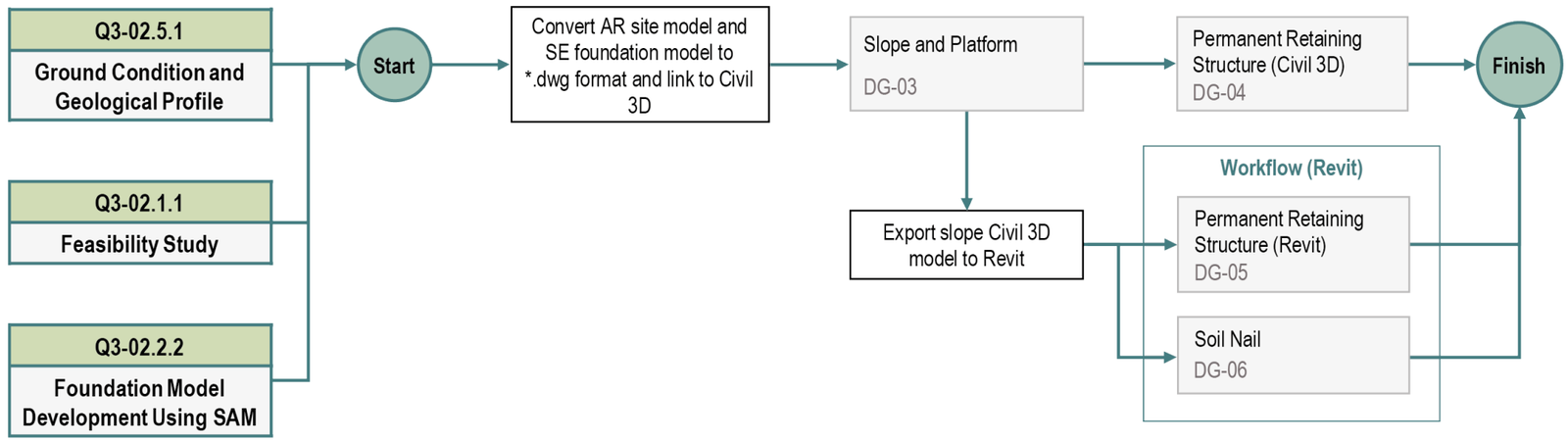
The first step in site formation modelling is to link existing topography model to Civil 3D.

There are two methods to link existing topography models to Civil 3D:

i) Export topography model to .landxml format, then import it to Civil 3D
ii) Use Data Shortcuts to create existing topography model reference

It is recommended to use Data Shortcuts reference is topography model to keep smaller size of files and single source of truth.

GE may make use of preliminary slope and platform model to conduct cut and fill volume calculation. For elements such as permanent retaining structure and soil nail, Revit is an appropriate tool. 3D solid from Civil 3D can be exported and imported into Revit. By Reversing the process, 3D solid in .dwg format can be exported and imported back to Civil 3D to complete the site formation model.



Q3-02.6 Civil Engineering (CE) Modelling

To first step is to determine which BIM software is used for CE elements modelling

Detailed BIM software uses shall be planned ahead and well-specified in project-specific PxP.

Both Revit and Civil 3D can effectively generate the models. However, if longitudinal profile view drawings are required, all elements should be created in Civil 3D.

Although Civil 3D is an effective BIM software for modelling of road, bridge, external drainage and water supply system, etc in the CE industry, some CE elements, may need to be created in Revit for coordination with other disciplines.

It is necessary to select the appropriate BIM software for different elements based on BIM use purposes and software skill set of the team members.

Typical BIM software are adopted for CE elements are as below:

Outside Housing site boundary: AutoCAD Civil 3D / Revit

Within Housing site boundary: Revit

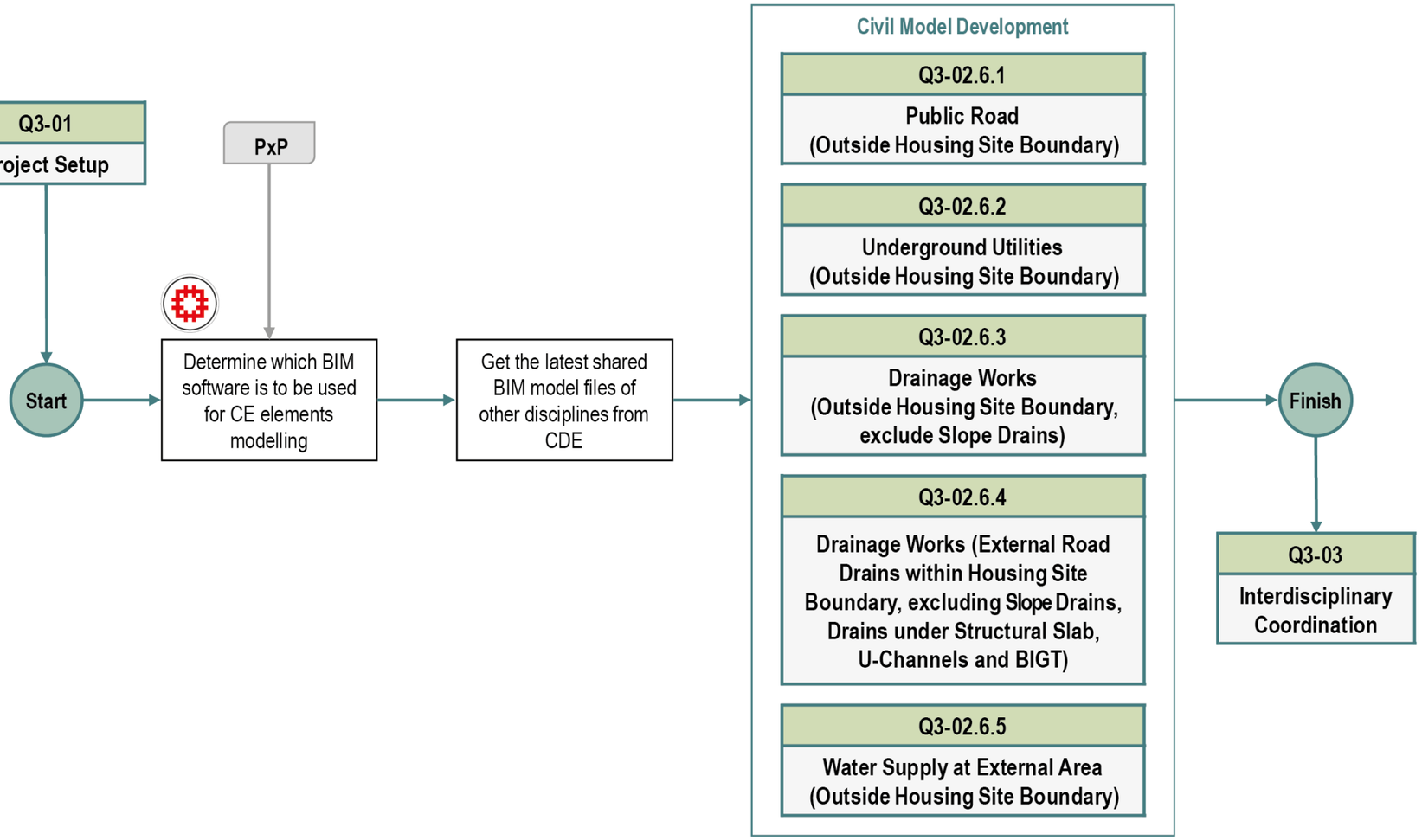
Civil engineering team can get the shared BIM models of other disciplines from the CDE and continue to develop the elements of the civil BIM models based on the Standard Approach to Modelling (SAM).

Before conducting Civil BIM modelling works, existing ground condition model and site formation model shall be reviewed to identify the site constraints and potential risks. Sections of ground surface can be generated to facilitate road design.

There are five main areas that require CE to input:

i) Public road (outside Housing site boundary) involving improvement, modification or upgrading works;
ii) Underground Utilities (outside Housing site boundary);
iii) Drainage Works (outside Housing site boundary), excluding slope drain;
iv) Drainage Works (External road drains within Housing site boundary), excluding slope drains, drains under structural slab, U-channels and BIGT; and
v) Water supply at external area (outside Housing site boundary).

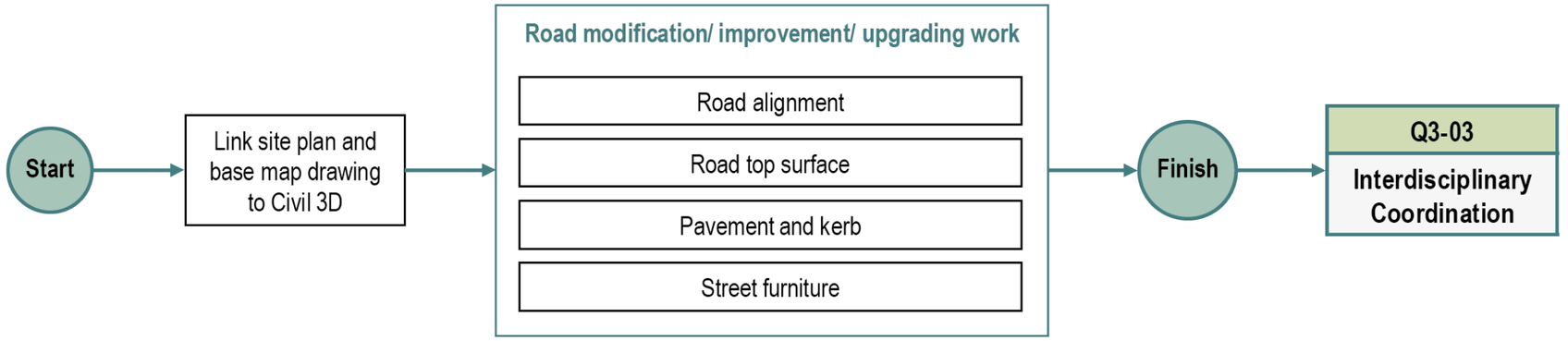
Upon approval by the Discipline Coordinator, the Civil BIM model is ready for interdisciplinary coordination.



Q3-02.6.1 Public Road (Outside Housing Site Boundary)

For road model within Housing site boundary, Revit will be used. For public road works outside Housing site boundary, Civil 3D will be used.

As a first step, link the site plan and base map as reference to proceed with road modification, improvement or upgrading. Depending on the work scope area, different models including road alignment, road top surface, pavement and kerb and street furniture will be included.



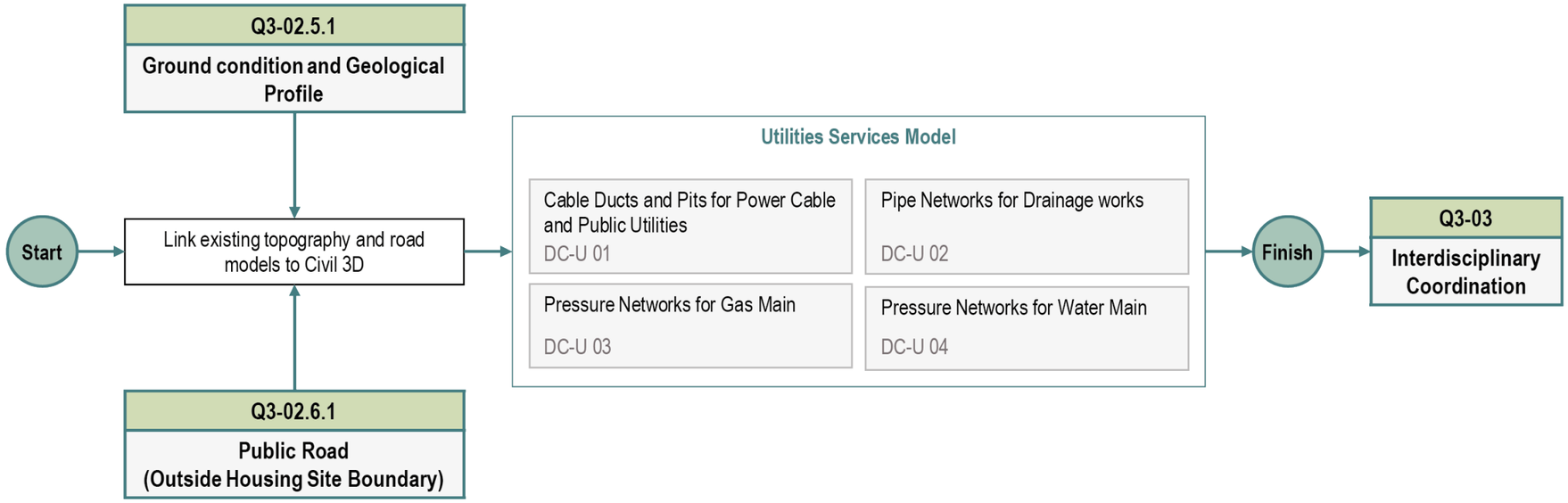
Q3-02.6.2 Underground Utilities (Outside Housing Site Boundary)

This workflow mainly involves those utilities services outside Housing site boundary that would use Civil 3D to align with other Works Departments (WDs).

Once the existing topography and road model are linked to Civil 3D, the utilities model can be built up by using pipe network or pressure networks.

Linking of topography and road models to Civil 3D

Please refer to **Q3-02.5.1 Ground Condition and Geological Profile** and **Q3-02.6.1 Public Road (Outside Housing Site Boundary)**.



Q3-02.6.3 Drainage Works (Outside Housing Site Boundary, exclude Slope Drains)

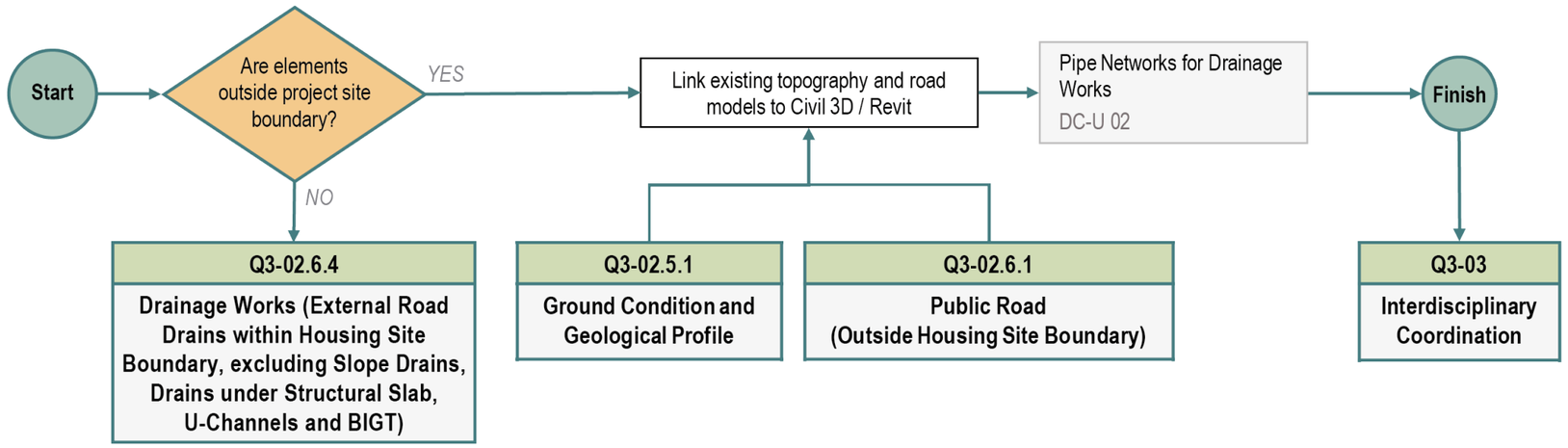
Drainage works will be divided into two locations, i.e. outside Housing site boundary or within Housing site boundary. Once the respective coverage areas are confirmed, two different workflows may commence.

Are elements outside Housing Site Boundary?

For drainage works outside Housing site boundary, in order to align with other Work Departments, Civil 3D / Revit will be used to prepare the drainage works model including project specific drainage part list, manhole and gully.

Linking of topography and road model to Civil 3D / Revit

Please refer to **Q3-02.5.1 Ground Condition and Geological Profile** and **Q3-02.6.1 Public Road (Outside Housing Site Boundary)**.



Q3-02.6.4 Drainage Works (External Road Drains within Housing Site Boundary, excluding Slope Drains, Drains under Structural Slab, U-Channels and BIGT)

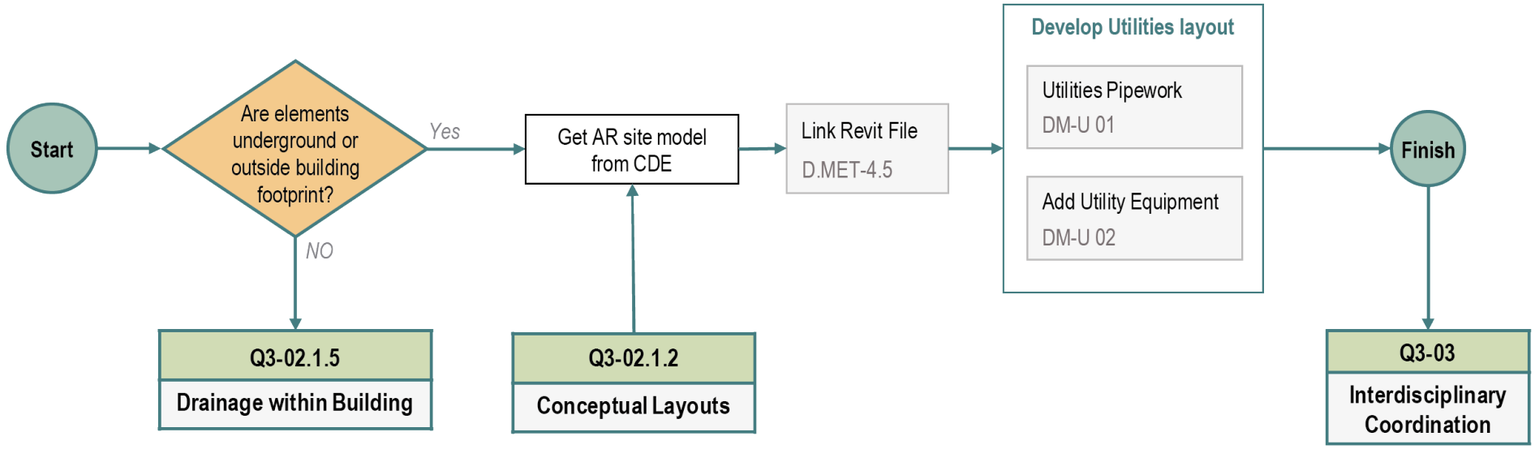
For drainage works within Housing site boundary, the first step is to distinguish whether it located inside a building or not. For drainage within a building, please refer to **Q3-02.1.5 Drainage within Building**.

Revit would be used to align with other disciplines for easy collaboration. By linking architectural model as reference, the drainage manhole and network may then be developed.

Need help on Project Base Point and Survey Point or have difficulties in linking Revit model?

Refer to **D.MET-4.2 Survey Point & Project Base Point** and **D.MET-4.5 Link Revit File**.

Once the model is finished, interdisciplinary coordination can be taken place.

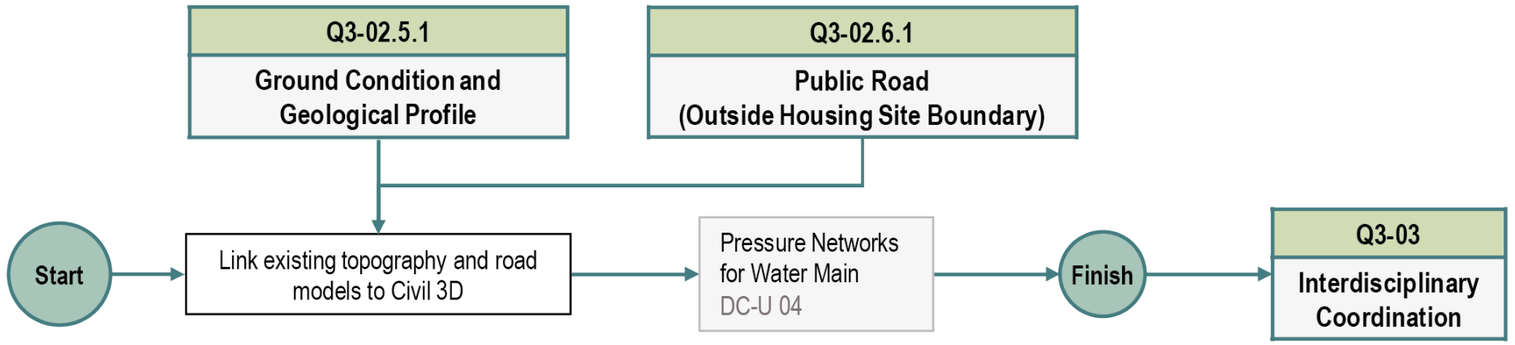


Q3-02.6.5 Water Supply at External Area (Outside Housing Site Boundary)

Before modelling in Civil 3D, existing topography model and road top surface model should be linked to Civil 3D to get the reference levels for pipes, fittings and thrust block.

Longitudinal profile can also be generated from Civil 3D.

It is recommended to use Data Shortcuts to reference existing topography and road models to keep smaller size of files and single source of truth.



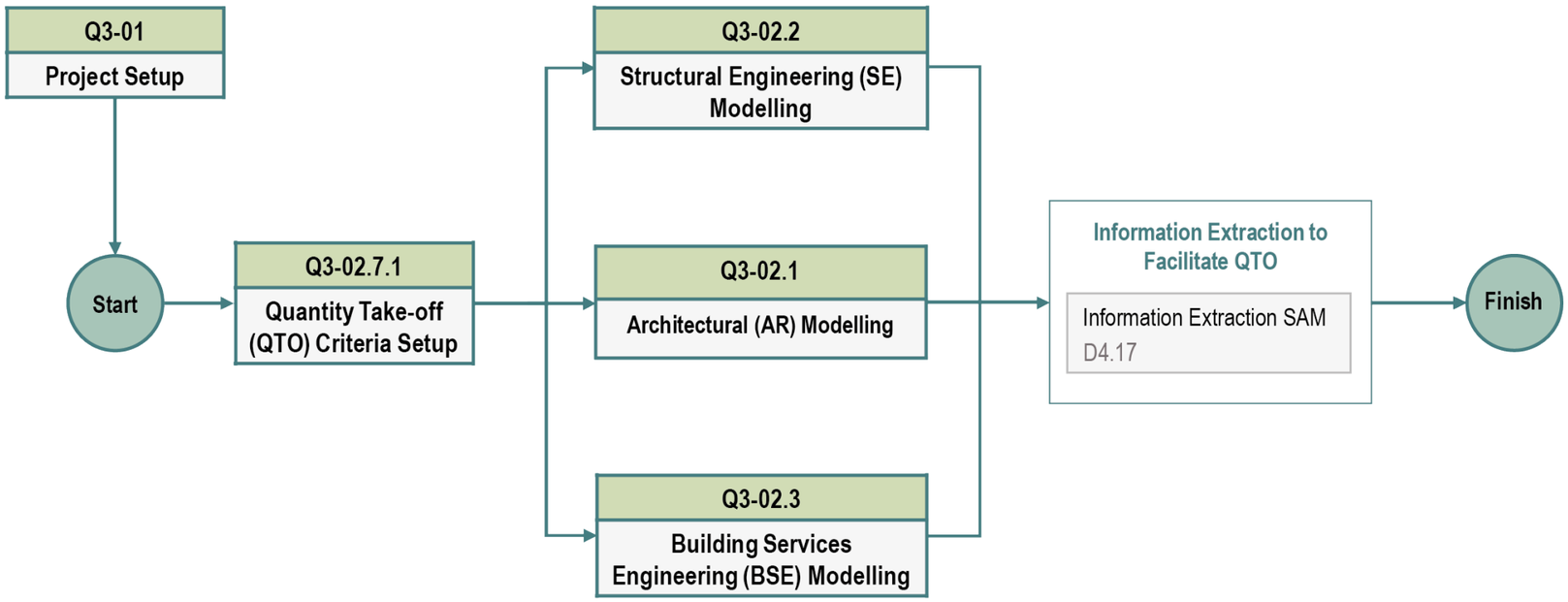
Q3-02.7 Quantity Surveying (QS) – Related BIM Use

PTs / PSPs / BIMSPs of different disciplines shall liaise with PQS and follow the workflow as illustrated in **Q3-02.7.1 Quantity Take-Off (QTO) Criteria Setup** before modelling starts.

To achieve BIM Use – Cost Estimation in Design Stage as listed in Q1. Quick Guide Level 1 – BIM Use Overview, PTs / PSPs/ BIMSPs shall create the Design BIM Models to facilitate PQS to use the BIM Models for conducting BIM QTO. BIM QTO scope implemented in HA are listed in **ANN-1.4** in ANN-1 of HABIMSG Annex.

After Design BIM Models by individual disciplines have been provided, PQS may extract information from the models to facilitate BIM QTO on items listed in **ANN-1.4** in ANN-1 of HABIMSG Annex.

General guidelines on information extraction by Revit Scheduling are described in **D4.17 Information Extraction SAM** of HABIMSG Vol.2**.**



Q3-02.7.1 Quantity Take-off (QTO) Criteria Setup

When project starts, project team should retrieve the latest set of Revit families from HA Library. Detail location to obtain the families shall refer to **ANN-1.3** in ANN-1 of HABIMSG Annex.

Not all families in HA library are QTO-enabled, but sample of QTO-enabled families are included in the specific location as shown in **ANN-1.3b** in ANN-1 of HABIMSG Annex.

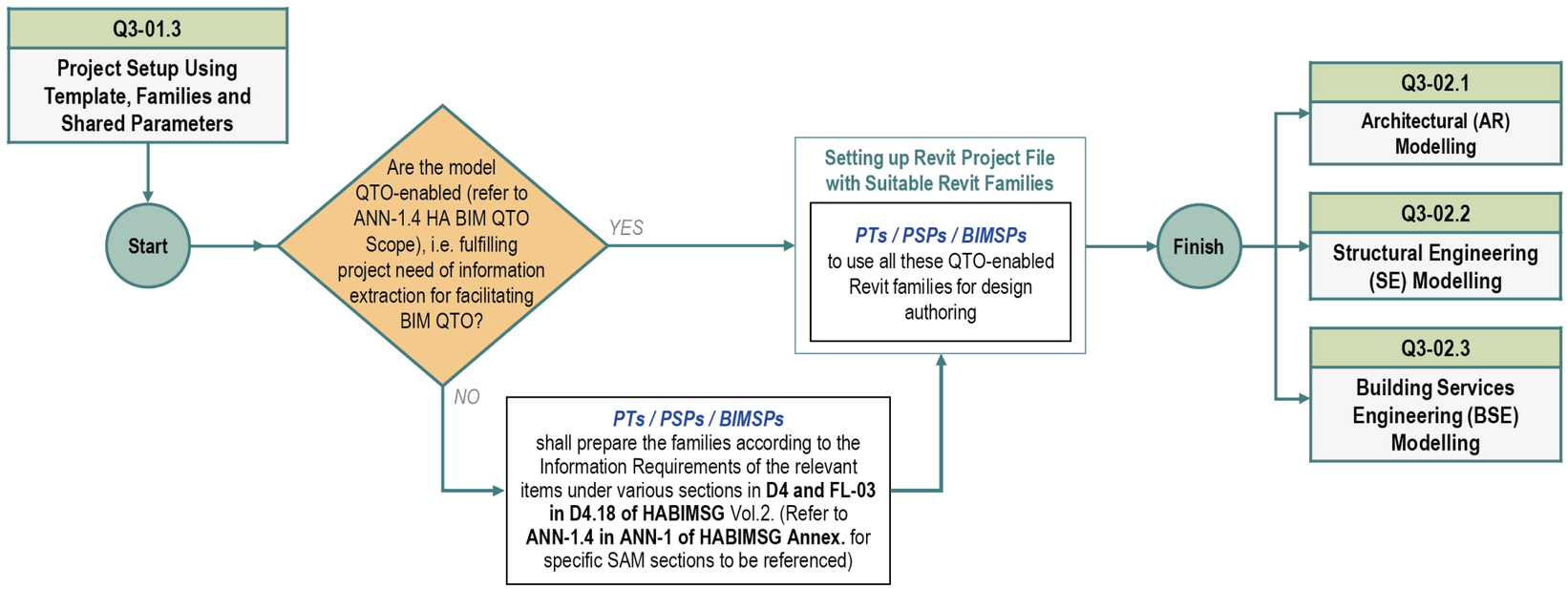
Before starting individual discipline modelling work, PTs / PSPs / BIMSPs should evaluate and ensure families are QTO-enabled for elements that fall under the HA BIM QTO scope as outlined in **ANN-1.4** in ANN-1 of HABIMSG Annex.

Are the models QTO-enabled (refer to ANN-1.4 HA BIM QTO Scope), i.e. fulfilling project need of information extraction for facilitating BIM QTO?

Samples of QTO-enabled Revit families could be obtained from HA Library.

PTs / PSPs / BIMSPs shall obtain and apply the QTO-enabled Revit families in HA Library to complete individual discipline modelling work.

When additional families or types are deemed necessary to fulfil the needs of information extraction for BIM QTO, PTs / PSPs / BIMSPs shall prepare the families according to the Information Requirements of the relevant items under various sections in **D4 and FL-03** of HABIMSG Vol.2. (Refer to **ANN-1.4** in ANN-1 of HABIMSG Annex for specific SAM sections to be referenced).

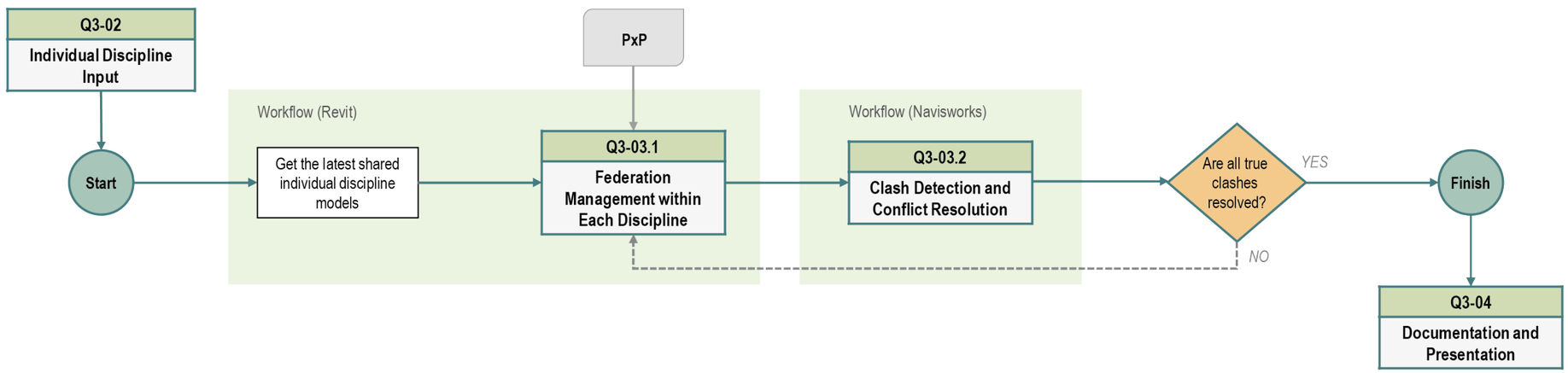


Q3-03 Interdisciplinary Coordination

At Interdisciplinary Coordination stage, individual disciplines rely on up-to-date information from other disciplines to advance their own designs while collaborating to resolve known spatial conflicts.

Are true clashes resolved?

It is important to ensure all clash subjects are located in the right spatial location and all conflicts eliminated.



Q3-03.1 Federation Management within Each Discipline

This workflow specifically describes the steps which individual disciplines should take to prepare discipline models for coordination, before the generated cache files are used by leading team or other disciplines.

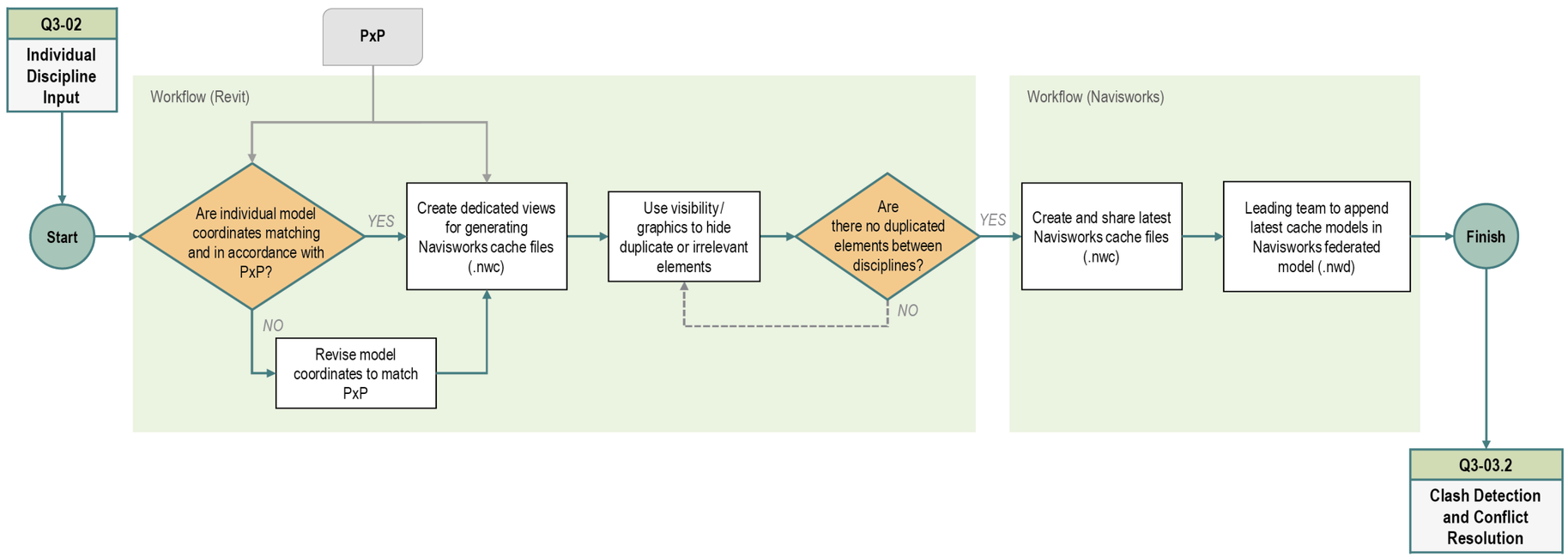
Are individual model coordinates matching and in accordance with PxP?

It is important to ensure all clash subjects are located in the right spatial location.

Are there no duplicate elements with other disciplines?

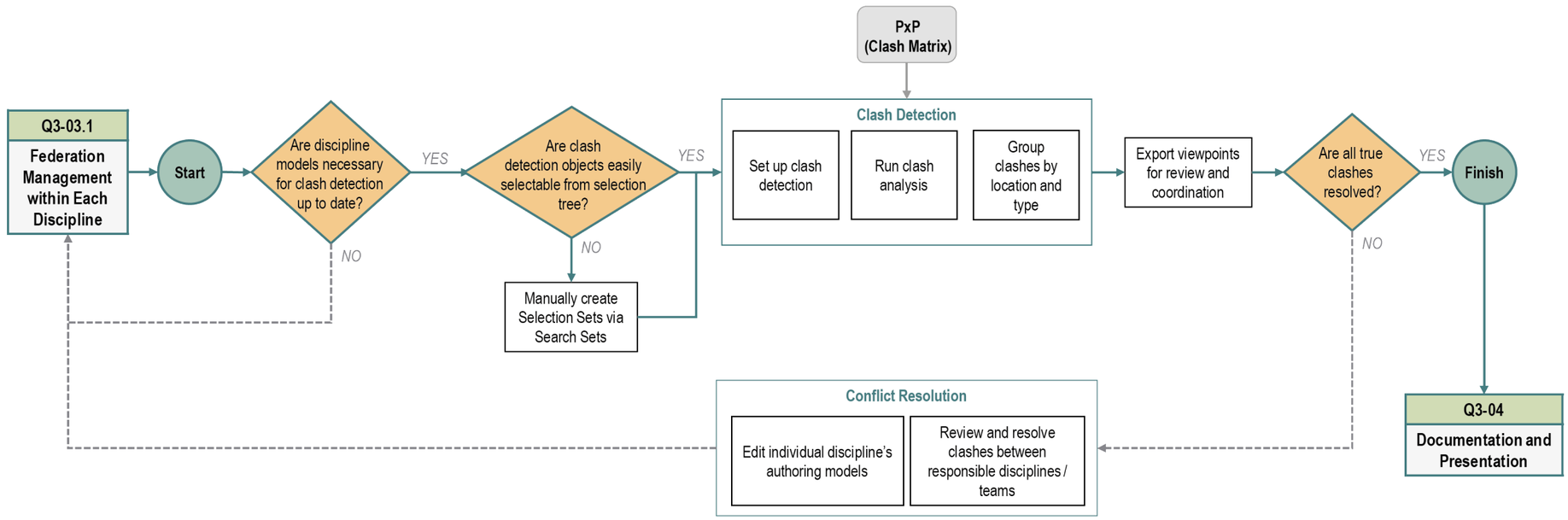
Duplicate elements increase the number of clashes, regardless of whether the duplications are the results of design errors or modelling errors. For example, architectural and structural walls often overlap in earlier project stages when both disciplines are going through the design processes and have not removed placeholders in their respective models. It is important to eliminate / hide duplicate or irrelevant elements.

Refer to Workflow **Q3-03.2 Clash Detection and Conflict Resolution** for details.



Q3-03.2 Clash Detection and Conflict Resolution

This workflow specifically describes the clash detection and conflict resolution that follows individual disciplines' cache file preparation, and is undertaken by the collaborative efforts of two or more disciplines.



Are discipline models necessary for clash detection up to date?

The leading team or discipline that is ready to conduct clash detection may find other disciplines' models outdated, as the frequency of producing cache files may vary. It is essential to ensure the models are up-to-date so as to obtain a valid clash result.

Are clash detection objects easily selectable from selection trees?

Sometimes objects as subject of clash detection are spread out or located inside / in interference with other objects and therefore are hard to select. In this case, use either element types or unique identifiers such as family name / description to create selection sets or search sets to group such elements.

In "Set up Clash Detective" step, the following steps shall be performed in Clash Detection:

- Edit selection of Selection A and Selection B
- Specify clash type
- Set Tolerance / Clearance

Are true clashes resolved?

True clashes mean actual conflicts in three-dimensional space that will cause construction issues. They shall not be left for work contractor to resolve on site.

Q3-04 Documentation and Presentation

Q3-04.1 Drawing Generation

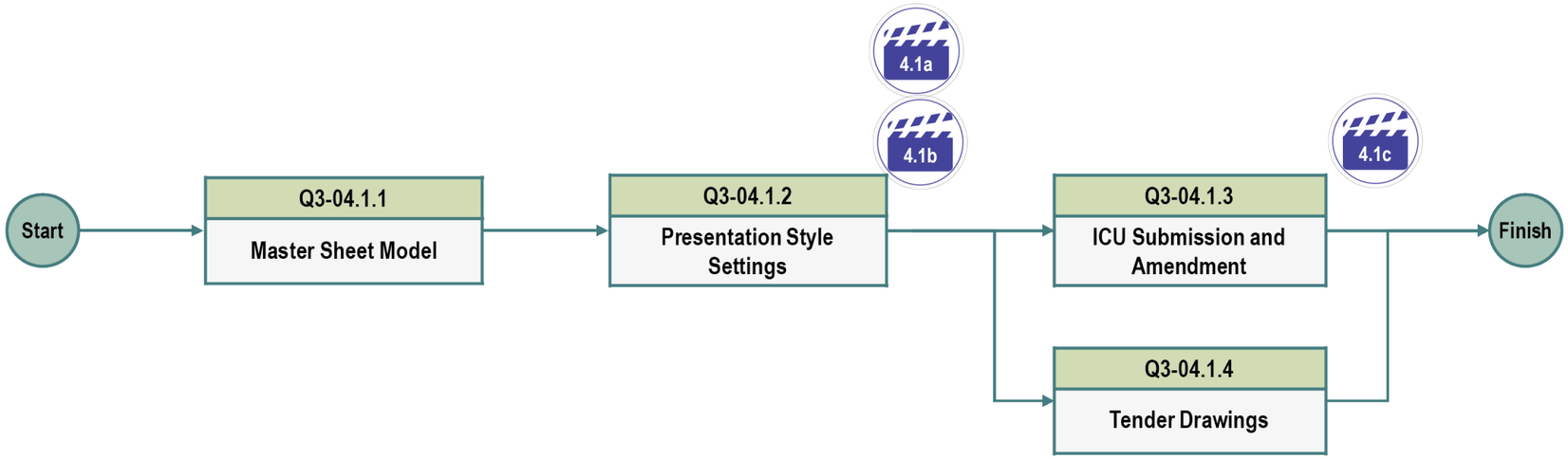
It is recommended that drawings be delivered from Master Sheet Model that links individual disciplinary models and all reference models.

See **D.MET-2.5 Drawing Model Segregation Strategy** of D3.2 in HABIMSG Vol.2 for details.

The drawing generation workflow contains three major stages:

1. Federation of Master Sheet Model
2. Setting of presentation styles
3. Drawing generation and Independent Checking Unit (ICU) submission and tender.

To reduce manual editing works, it is suggested that model authors follow the sequence of the workflows, especially **Q3-04.1.2 Presentation Style Settings** prior to producing corresponding drawings. Early confirmation and finalisation of presentation style will result in View Templates which can be efficiently applied to multiple drawings.

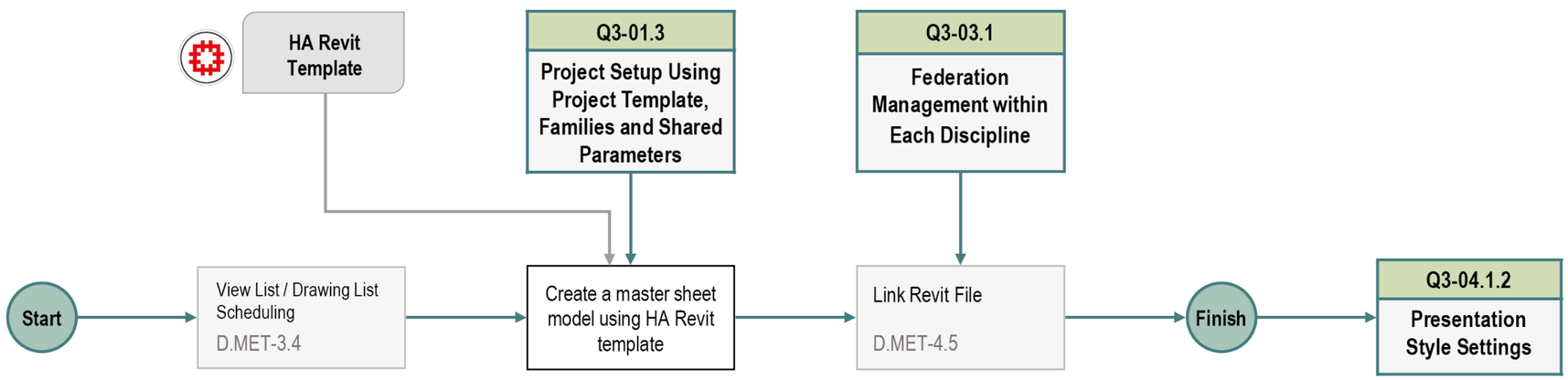


Q3-04.1.1 Master Sheet Model

Master Sheet Model shall be created using HA Revit template, which can be found in the locations as indicated in the **Annex** of this Guide

Master Sheet Models are essential for managing drawing packages and shall be created for each distinct drawing package to be issued.

Master Sheet Models are created by first ensuring that no sheets to be issued are embedded in individual model files. Applying the principle of **Q3-03.1 Federation Management within Each Discipline**, model authors shall link individual models into Master Sheet Models to complete the workflow.



4.1a

Q3-04.1.2 Presentation Style Settings

4.1b

This workflow is closely related to **Q3-04.1.3 ICU Submission and Amendment** and **Q3-04.1.4 Tender Drawings** which pertain to drawing generation. In Revit, presentation styles are controlled by Visibility / Graphics (VG) settings. A View Template pre-populates VG settings which, upon verification that its settings are correct, can be applied to multiple views instantly.

To minimise manual editing works, this workflow makes sure the existing View Templates are checked prior to setting presentation styles from scratch.

Is a suitable View Template available for the specific presentation of drawings?

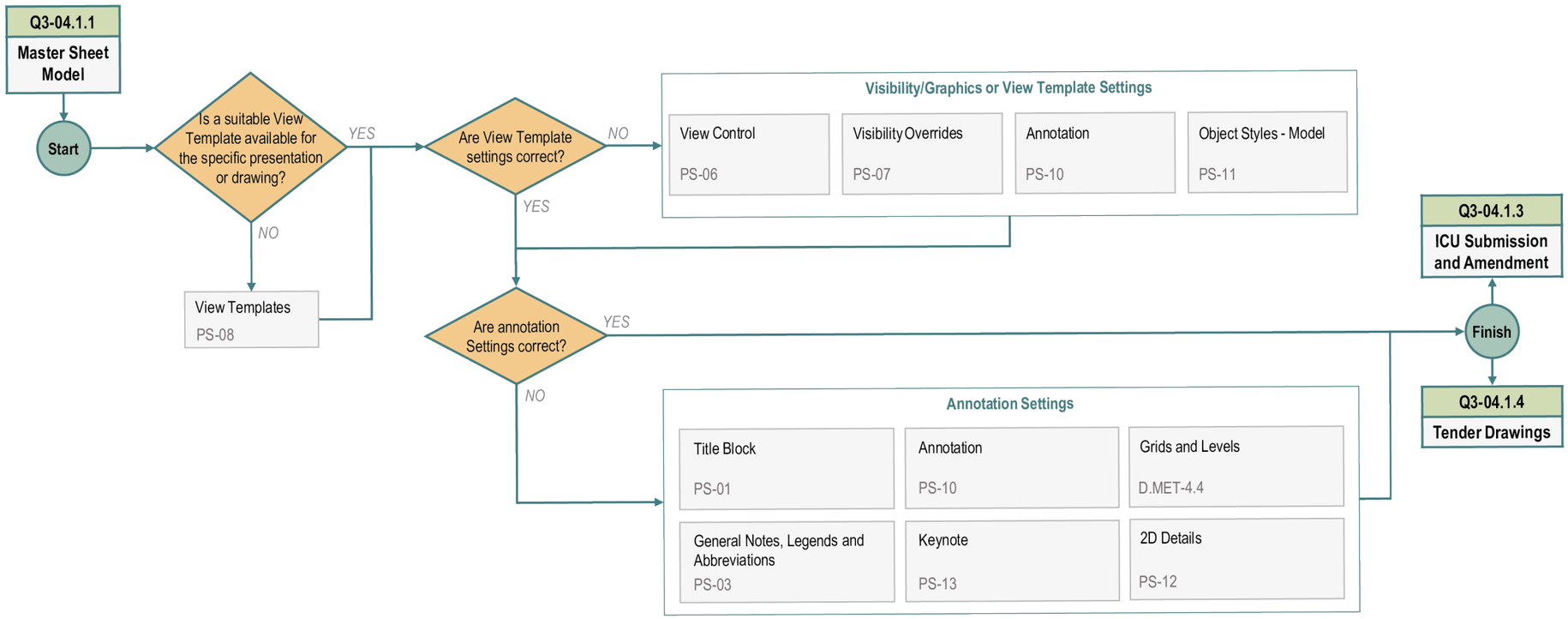
If a suitable View Template exists, model authors can save time by checking the template and revising it as necessary to suit the purpose, rather than starting from scratch.

Are view template settings correct?

If yes, the detailed steps of Visibility / Graphic settings can be skipped. If no, Section 7 of detail guide can be referred to.

Are annotation settings correct?

If yes, the detailed steps of annotation settings can be skipped.



4.1c Q3-04.1.3 ICU Submission and Amendment

ICU submission is a key project stage in which AR and SE model elements are mandatory to reach LOD-G 300 + LOD-I 300 or above to display sufficient details on drawing sheets.

Drawing list shall be determined to decide which views and sheet list should be included in the ICU submission. The View Template in **Q3-04.1.2 Presentation Style Settings** provides convenient setting for ICU submission; other content details shall be developed in Revit for subsequent for drawing quality check.

Are essential views and schedules contained in model?

Check whether model contains essential views and schedules suitable for ICU submission. If No, please go back to **Q3-04.1.2 Presentation Style Settings**.

ICU amendment submissions?

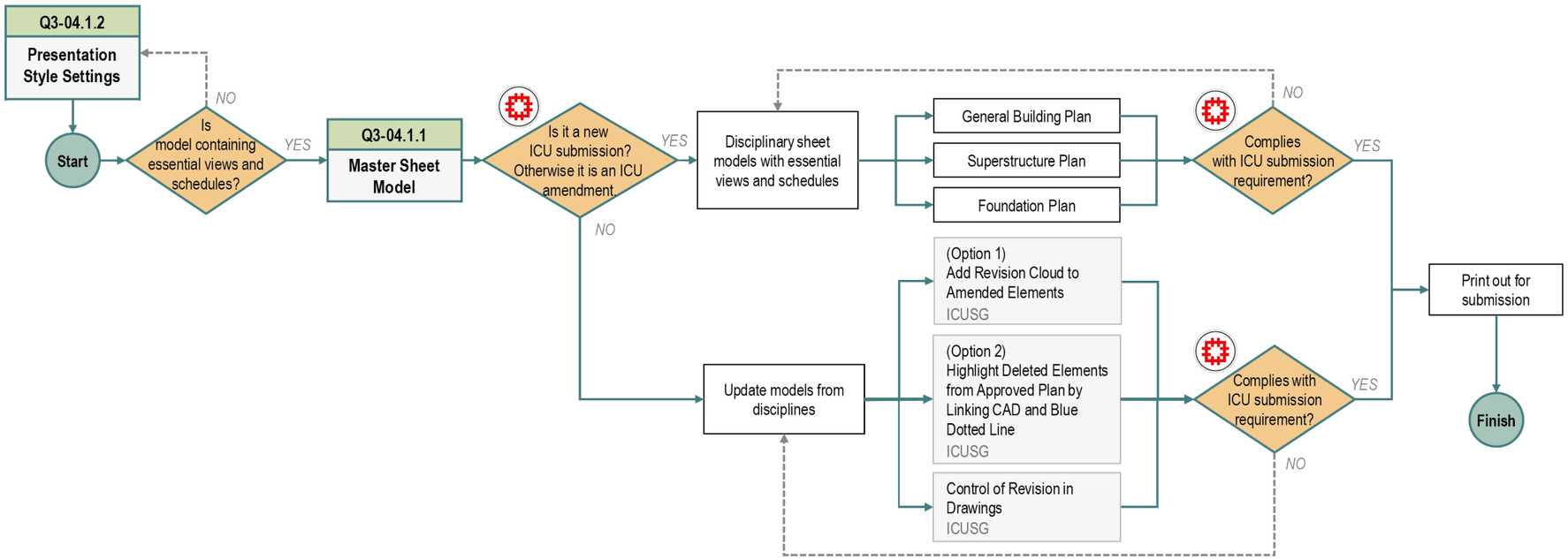
ICU amendments include changes in both model elements and presentation styles. Model element changes depend on input from individual disciplines while presentation style shall be adjusted per Presentation Style Setting workflows.

Do drawing contents comply with ICU submission requirements?

In addition to typical quality control checks that are conducted in parallel, it is an ideal time to perform a visual check on drawing contents immediately before submitting the drawings to ICU.

Drawing format correctness relies on carefully follow-through the Presentation Style Settings workflow including colouring compliance. Incorrect presentation style shall be rectified prior to printing.

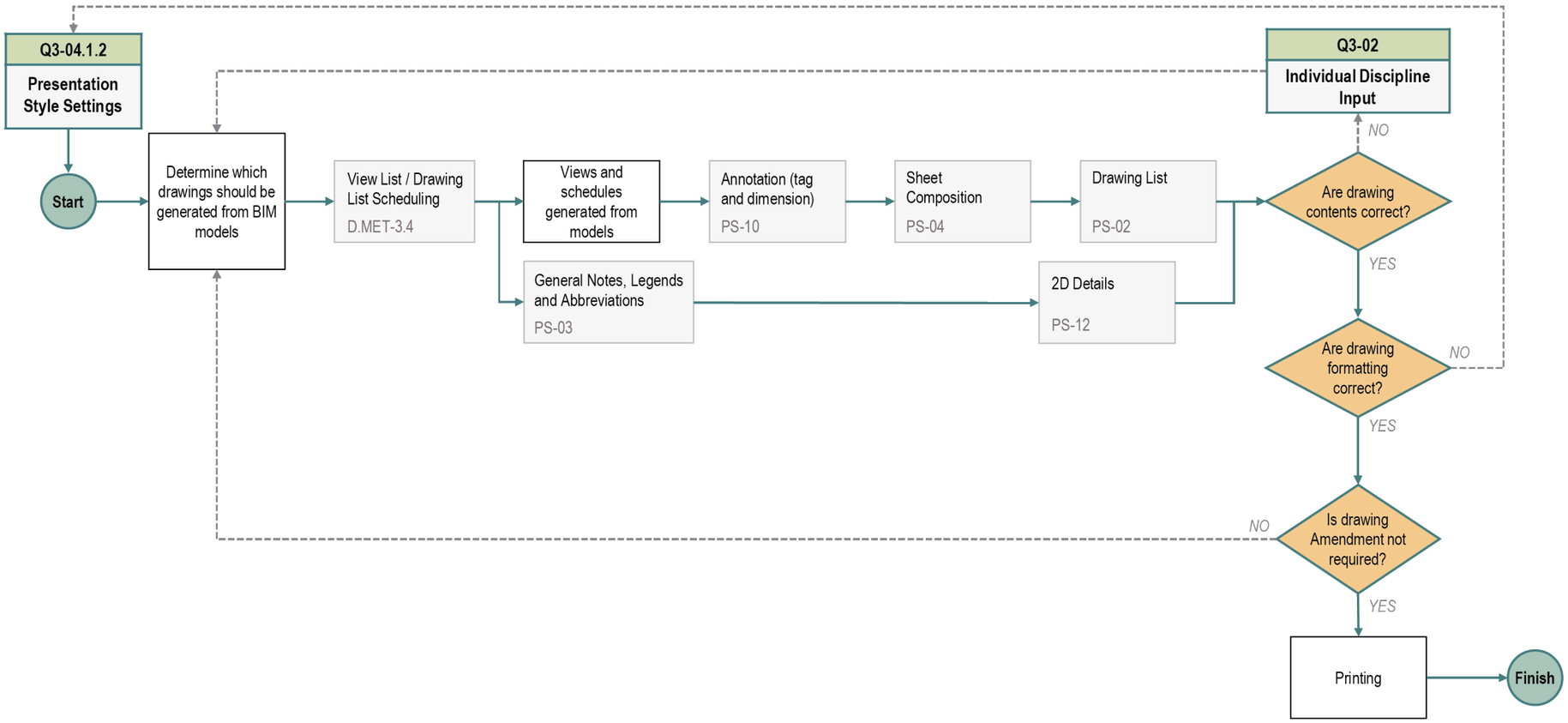
Reference shall be made to **ICU BIM Standards and Modelling Guidelines for Statutory and Building Control Submission of GBP, Foundation Plan and Superstructure Plan** for detailed steps. Further supplementary can also be found in **D5.4** of HABIMSG Vol.2.



Q3-04.1.4 Tender Drawings

The preparation of tender drawings follows a similar workflow as ICU submissions. At this stage, generally speaking, AR and SE model elements must reach LOD-G 300 +LOD-I 300, and BSE model elements must reach LOD-G 200 + LOD-I 300, to display sufficient details on drawing sheets.

Some drawings such as General Notes and 2D Typical Details may not be efficiently delivered from BIM and may be generated directly from CAD.



Are drawing contents correct?

As drawings are not formatted, in addition to typical quality control checks that are conducted in parallel, it is an ideal time to perform a visual check on drawing contents before tender is issued. Incorrect contents can be rectified by revisiting **Q3-02 Individual Discipline Input** workflows.

Are drawing formatting correct?

Drawing formatting correctness relies on carefully following through the **Q3-04.1.2 Presentation Style Settings** workflow. Incorrect presentation style shall be rectified prior to printing.

In addition, users may refer to **ICUSG** and **Q3-04.1.3 ICU Submission and Amendment** for presentation styles specifically related to ICU drawing generation.

Is drawing amendment not required?

Drawing amendments include changes in both model elements and presentation styles. Model elements shall follow Individual Discipline Input workflow while presentation style shall be adjusted per Presentation Style Setting workflow.

Q3-04.2 Model Walkthrough (3D)

Model walkthrough can be conducted using either Navisworks or compatible photorealistic visualization software / plugins such as Enscape. To decide which route to proceed, PTs / PSPs / Contractors must first consider the following three questions:

Will 3D walkthrough be produced in conjunction with 4D simulation?

If yes, it is recommended to use Navisworks to maximize synergy and minimize rework.

If no, PTs / PSPs / Contractors shall proceed to the next question.

Is Enscape or other photorealistic visualization software/plugins available?

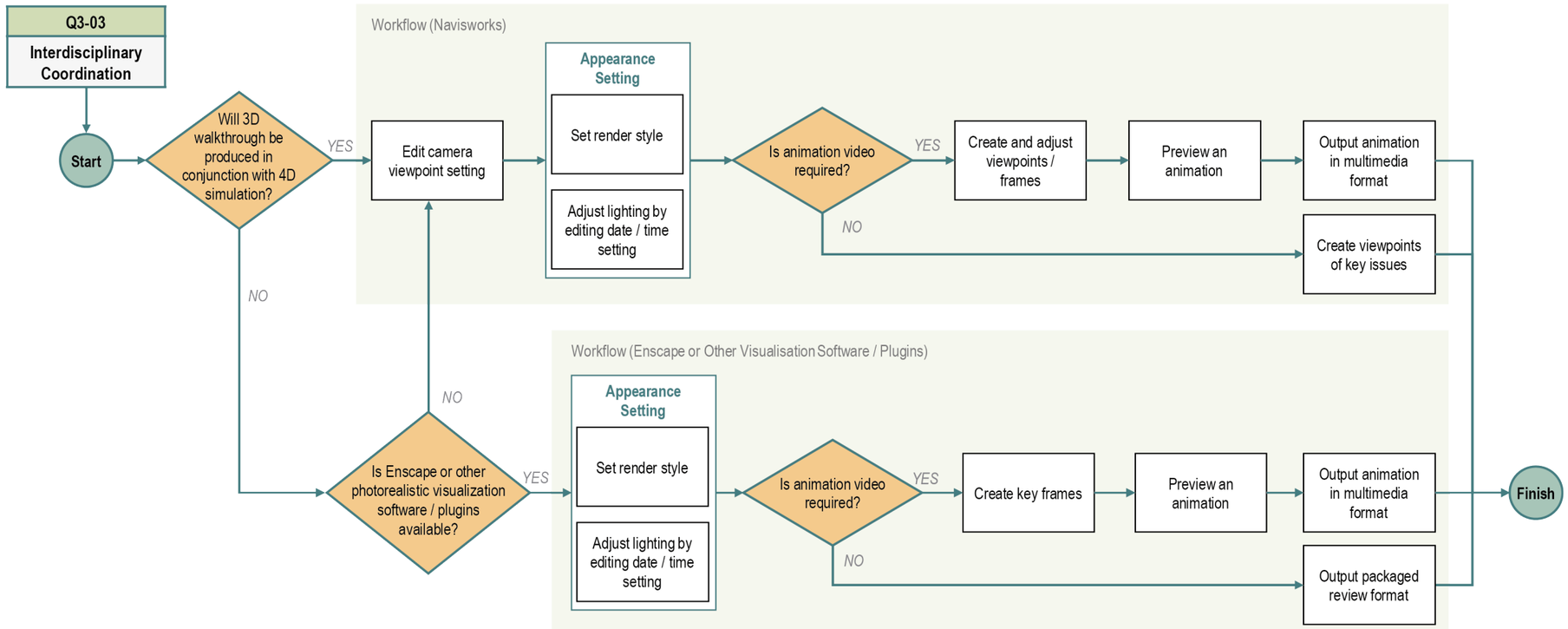
If yes, PTs / PSPs / Contractors are encouraged to utilize them for walkthroughs that are more photorealistic.

If no, PTs / PSPs / Contractors may revert to using Navisworks.

Is animation video required?

If yes, additional steps including creating viewpoints (or key frames), preview and output animation shall take place prior to considering the task finished.

The workflows in either branch follow similar steps of setting up appearances, and if a standalone multimedia video is required, key frames shall be created and adjusted along walkthrough path. Alternatively, PTs / PSPs / Contractors can package a review file which is either .nwd for Navisworks or .exe for Enscape.

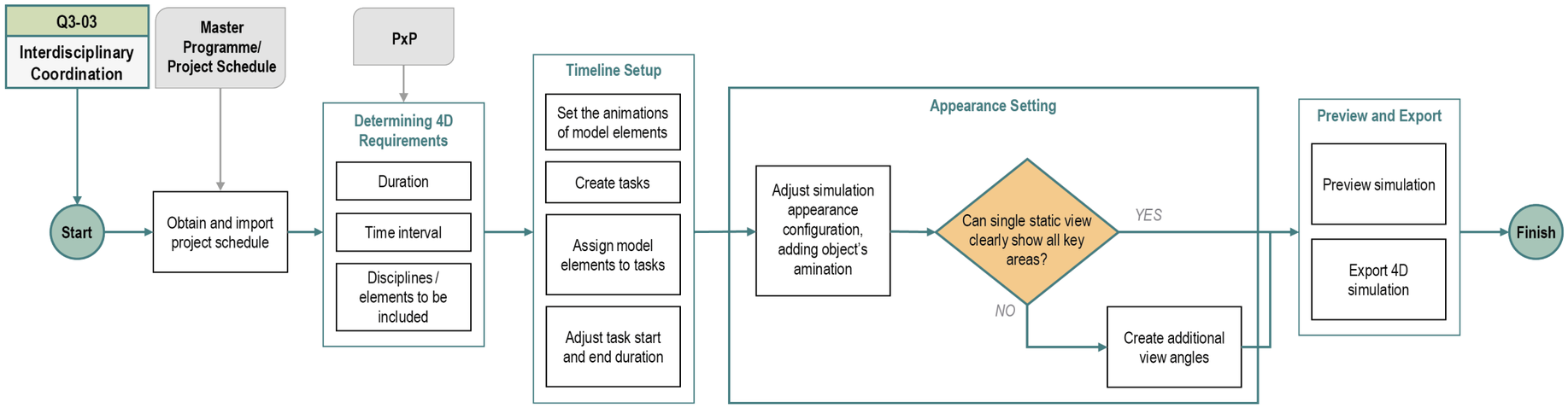


Q3-04.3 Construction Sequence Simulation (4D)

Although both using Navisworks, in addition to appearance such as view angles and view settings, 4D construction sequence simulations have a few additional considerations.

Basic requirements such as duration, time interval, and disciplines / model elements to be included must be defined prior to starting work on the simulation.

Additional setting on adjusting model appearance and adding individual object's animation can be considered before linking elements with tasks. Model elements may also be grouped as different search sets / selections to be matched correctly to tasks with the right durations.



Can single static view clearly show all key areas?

Multi-angle views throughout the simulation to highlight key areas construction activities may be considered.

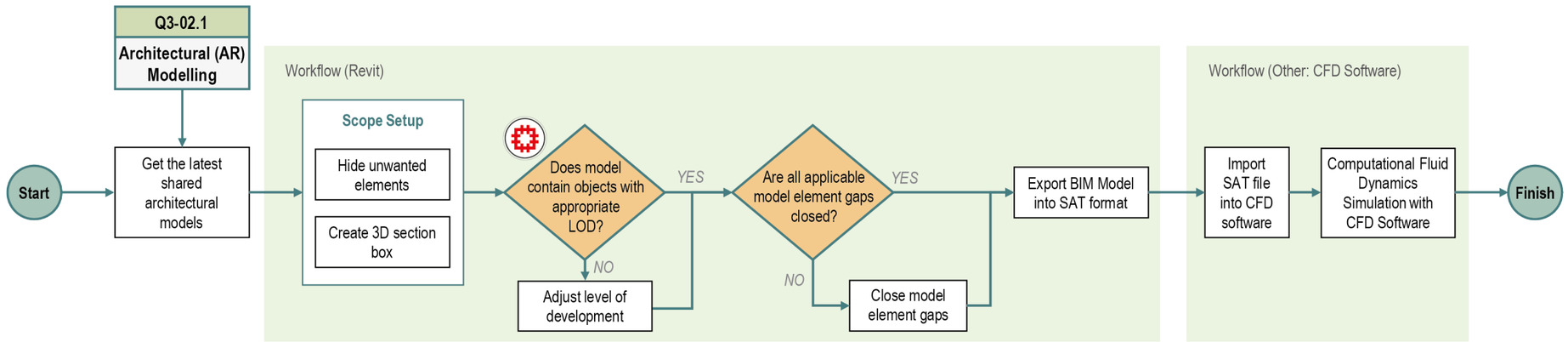
Q3-04.4 Computational Fluid Dynamic (CFD)

CFD simulation utilises native Architectural BIM models as the basis.

Does model contain objects with appropriate LOD?

For CFD analysis suitable for HA-specific practice, the optimal LOD-G is 100-200. It is recommended to avoid high LOD-G which may result in slowness and error. Any model element with LOD-G higher than 200 shall be simplified or replaced with lower- LOD-G types / families prior to proceeding with the analysis.

Software such as Autodesk CFD cannot directly use native authoring BIM files. In most cases including Autodesk CFD, relevant parts of native BIM models shall be exported into SAT format for import.



Q3-04.5 Sun and Shadow Analysis

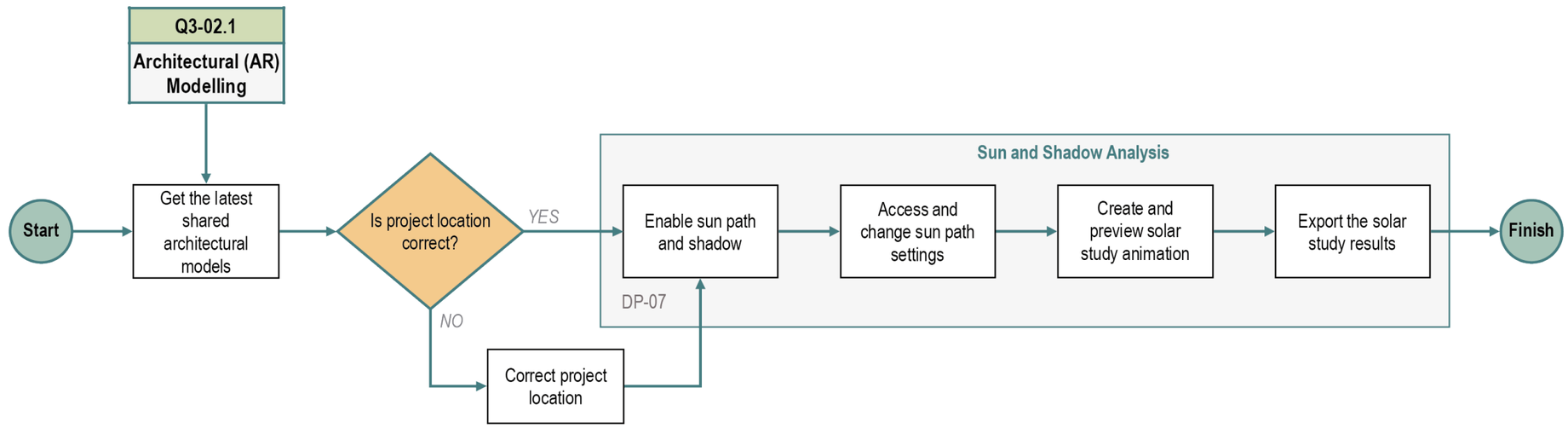
Sun and shadow analysis utilises native Architectural BIM models as the basis.

Is project location correct?

While the QA / QC workflow group will ensure that project location is correct, in the unlikely event that the location is missing or incorrect, it must be rectified prior to proceeding with sun and shadow analysis to ensure accurate results.

Simply enable "Sun Path and Shadow" and adjust the preferred date and time setting, then the preview of solar study animation will be available.

Please refer to **DP-07 Sun and Shadow Analysis** for detailed steps.



Q3-05 BIM Quality Control and Quality Assurance (QC / QA)

The purpose of BIM QC / QA workflow is to provide a systematic way of checking BIM project startup and BIM files with a view to producing a cumulative trackable record of model improvement.

This section provides general workflows for BIM QC / QA. If additional QA plans are proposed, PT / PSP / Contractor shall document them in the PxP in detail.

The HA BIM QA Checklists consist of Project Startup Checklist and Model Compliance Checklist.

QA of BIM project start-up

Upon commencement of the project, PT / PSP / Contractor / BIMSP shall undergo BIM Quality Assurance for the BIM project startup on several aspects. At minimum, BIM Manager should ensure that the team:

- Has gathered all the available resources as listed in the **Annex** of this Guide
- Understands which sections of HABIMSG and other HA guidelines to follow for various aspects of BIM setup
- Understands what deliverables are induced for each BIM Use required for the Agreement / Contract

HA Project Startup Checklist is provided in **ANN-1.2a** in ANN-1 of HABIMSG Annex and shall be completed and documented in PxP to record the check results.

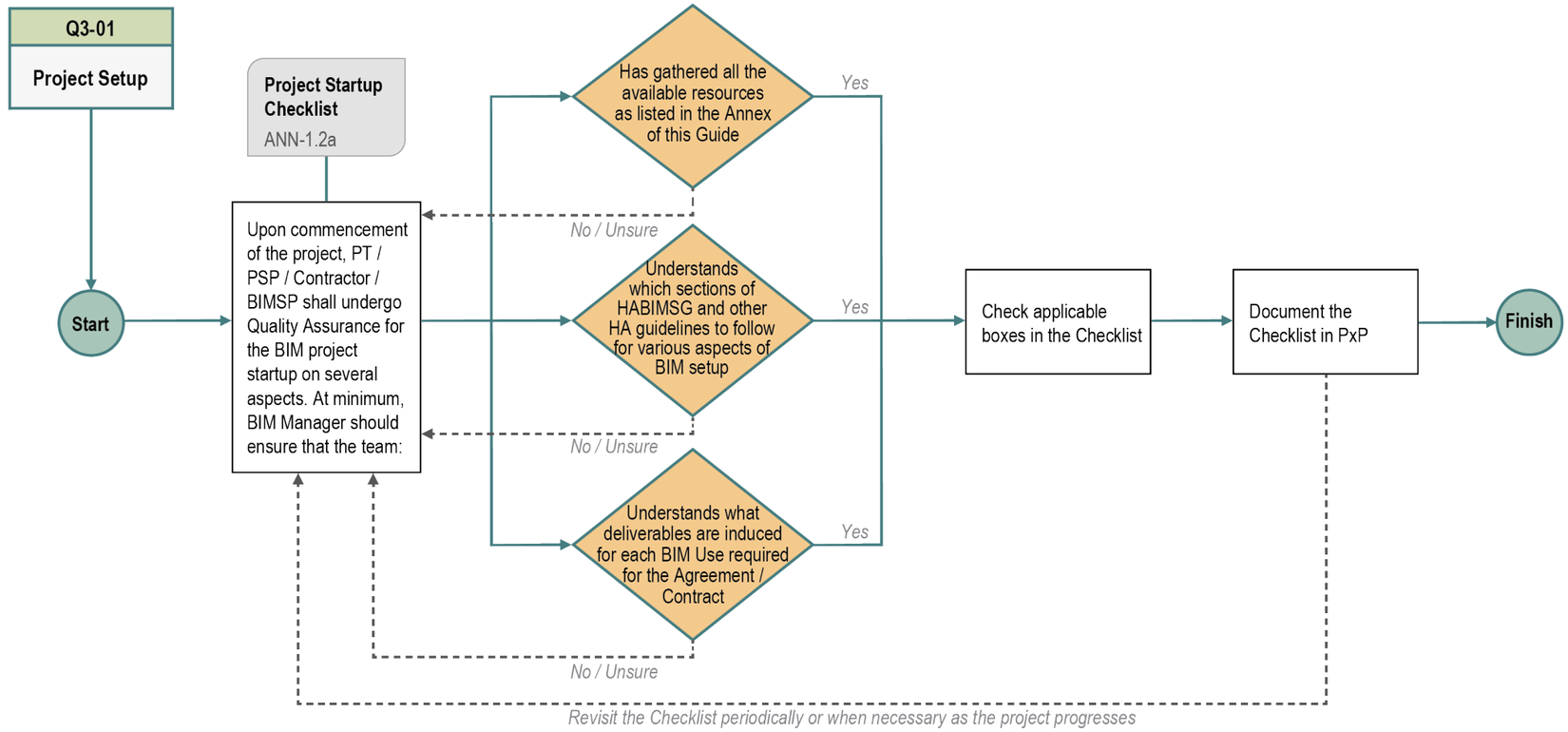
QA of BIM model

Is the BIM model built by PT / PSP / Contractor or BIMSP?

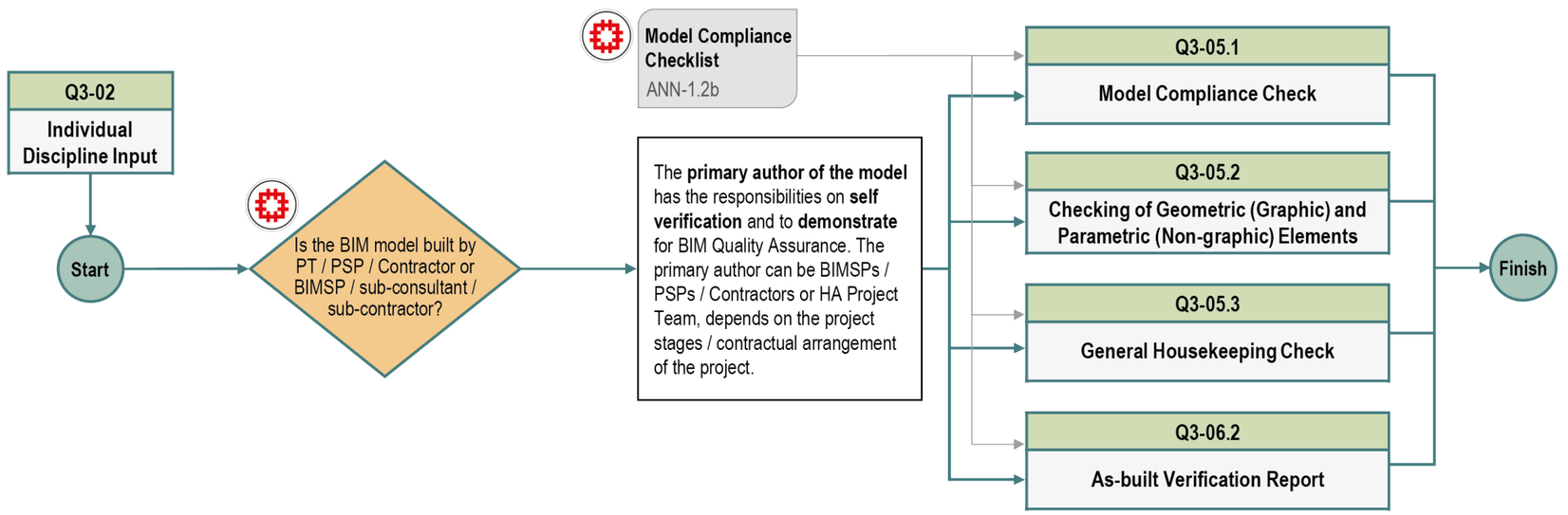
The **primary author of the model** has the responsibilities on **self verification** and to **demonstrate** for BIM Quality Assurance. The primary author can be BIMSPs / PSPs / Contractors or HA Project Team, depends on the project stages/ contractual arrangement of the project.

HA Model Compliance Checklist is provided in **ANN-1.2b** in ANN-1 of HABIMSG Annex is mandatory for all work in progress (WIP) submission at different stages, Finalized Design BIM Model and as-built BIM Model at project completion. Contractors shall also complete as-built verification report in the HA BIM Model Compliance Checklist for submission of the as-built BIM Model.

(a) QA of BIM project startup



(b) QA of BIM model



Q3-05.1 Model Compliance Check

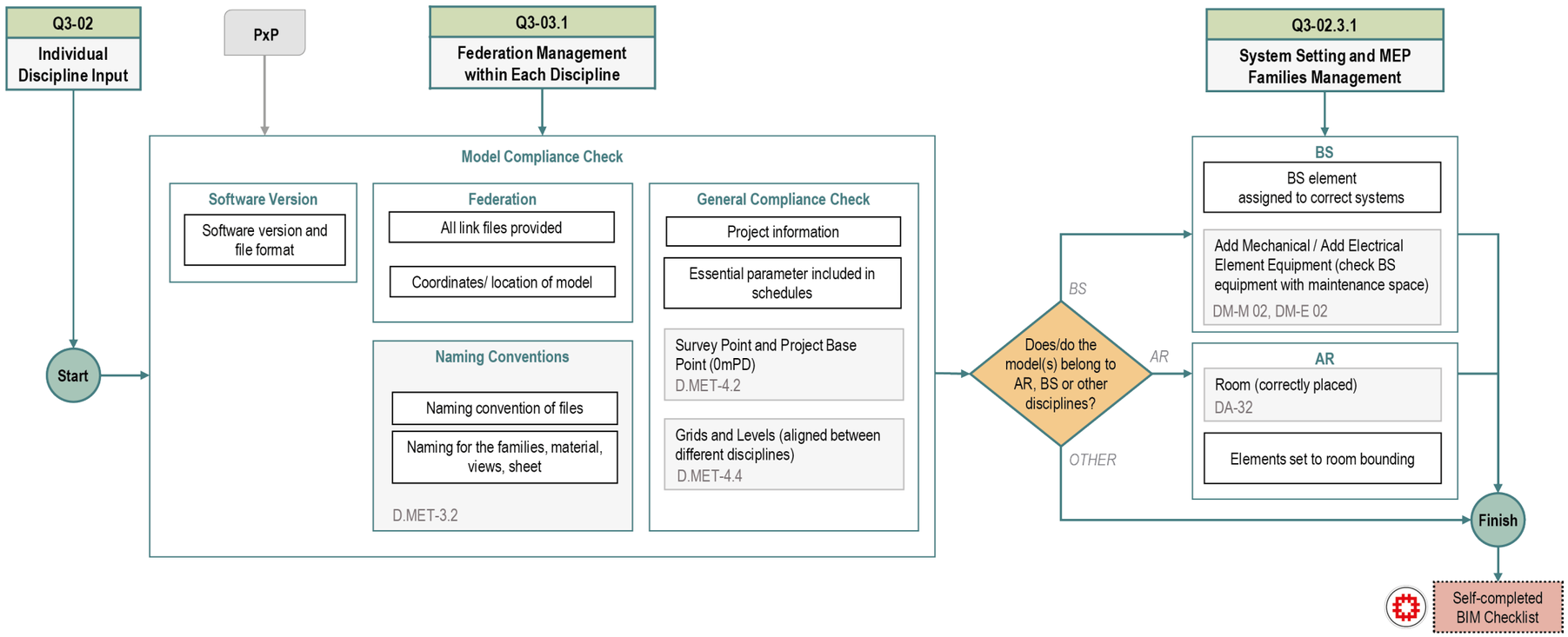
Model Compliance Check focuses on whether BIM files comply to HABIMSG's minimum requirements, including:

1. Software version
2. Federation management
3. Naming of models, families, other BIM files and BIM file contents
4. General items such as project information, essential parameters, project unit, survey point and project base points, and levels and grids.

PTs / PSPs / Contractors shall refer to relevant SAMs for proper modelling methods to revise models when issues are found.

Does / do the model(s) belong to AR, BS or other disciplines?

Certain checks are relevant to AR and BSE models. Other discipline BIM files may skip these checking steps.



Check results shall be recorded in the Model Compliance Checklist.

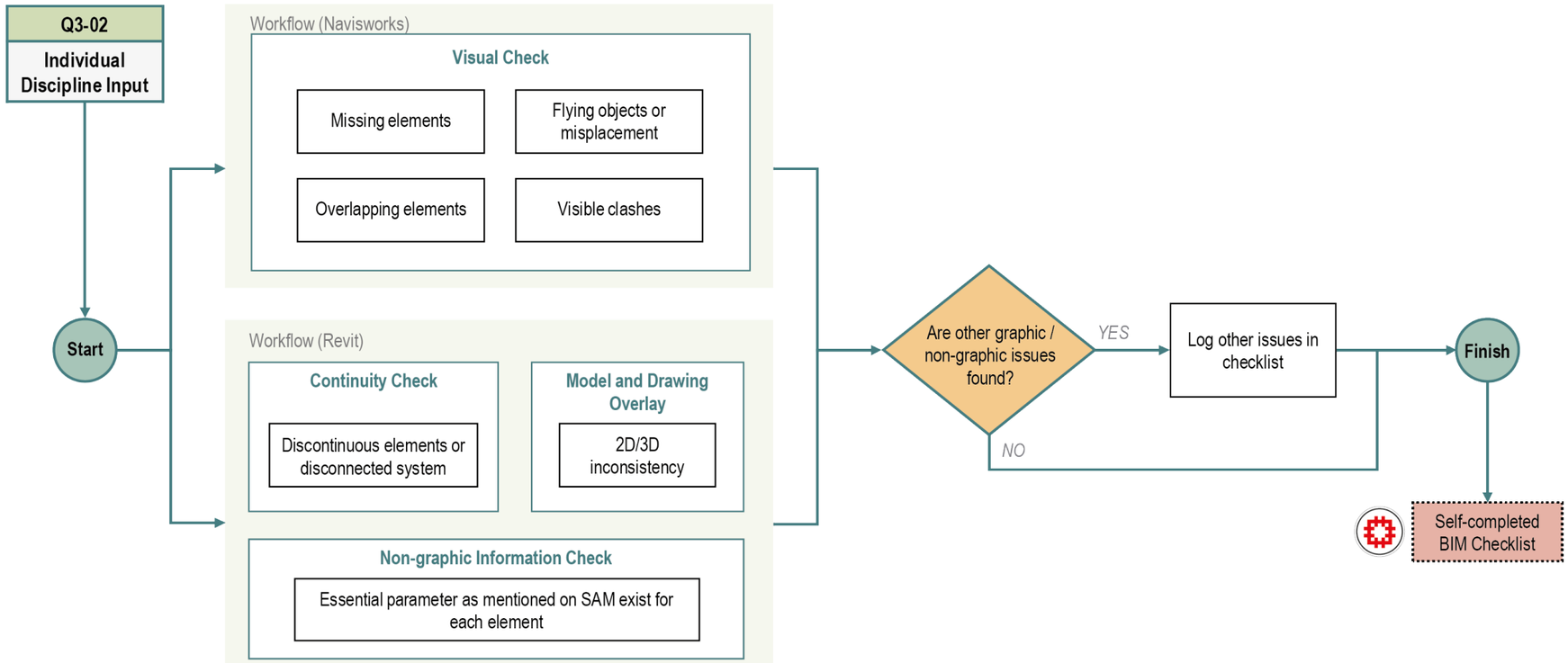
Q3-05.2 Checking of Geometric (Graphic) and Parametric (Non-graphic) Elements

To optimize efficiency and avoid duplication of efforts, checking of graphic and non-graphic model elements shall be conducted in the more suitable software (either Revit or Navisworks). For basic visual checks, it is recommended to use Navisworks to leverage smaller file size and faster operation speed. For checks related to systems, errors and warnings, 2D / 3D consistency and essential parameters, Revit shall be used for completeness.

Are other graphic / non-graphic issues found?

Other issues may include detailed modelling methodology issues that are not compliant with SAM. While they may not affect model and drawing accuracy, it is recommended to log these issues for record.

Check results shall be recorded in the Model Compliance Checklist.

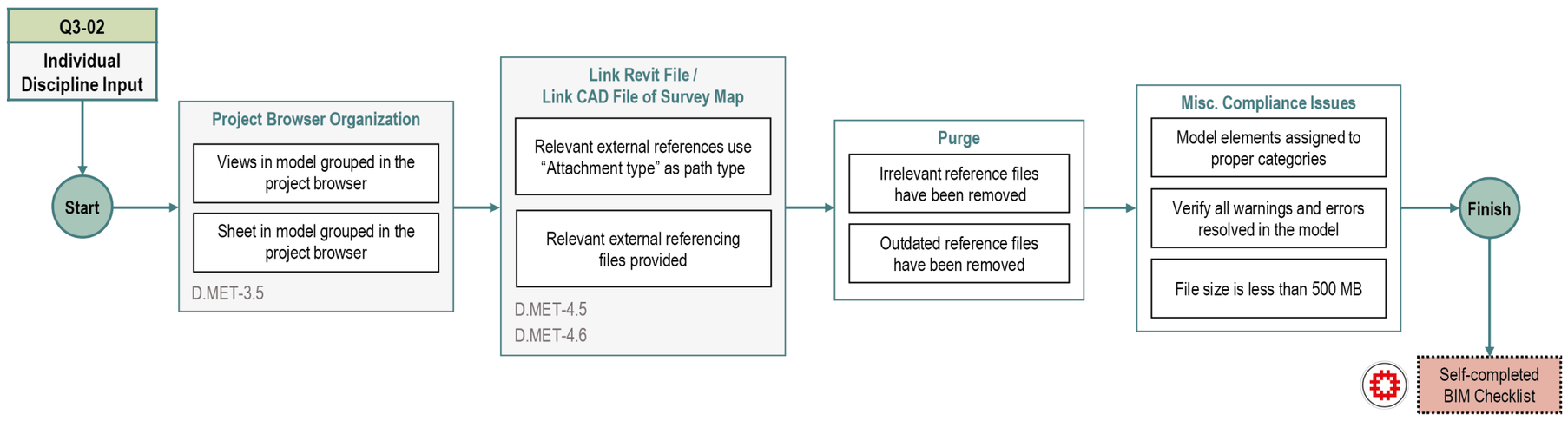


Q3-05.3 General Housekeeping Check

General housekeeping check focuses on cleanliness of BIM files, thereby optimizing file sizes for better operability and ease of navigation.

1. Project browser organization shall have views and sheets grouped.
2. Revit files shall be linked using Relative path type, while external references shall be linked using Attachment type. All relevant linked files shall be made available when sharing.
3. Irrelevant and outdated references shall be removed.
4. Model elements shall be assigned to proper categories.
5. All errors and warnings shall be resolved.
6. File size shall be less than 500 MB.

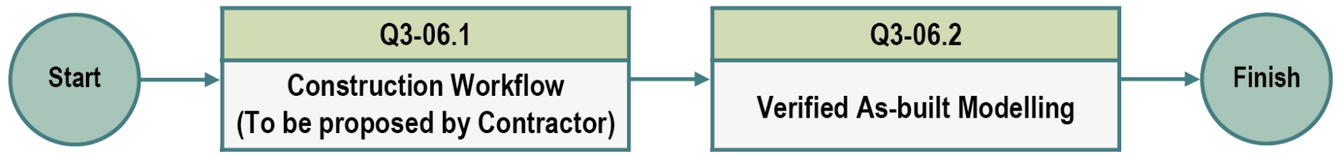
Check results shall be recorded in the Model Compliance Checklist.



Q3-06 Construction and As-built

During construction stage, Contractors shall go through **Q3-01 Project Setup, Q3-02 Individual Discipline Input, Q3-03 Interdisciplinary Coordination, Q3-04 Documentation and Presentation, Q3-05 BIM Quality Control and Quality Assurance (QC /** QA) **and Q3-07 Handover of BIM Model** and further propose and develop the Construction and As-built workflows made fit for the project conditions and requirements. The construction workflows shall cover, but not be limited to the followings:

- Design Authoring
- Design Reviews
- Existing Conditions Modelling
- 3D Coordination
- Phase Planning (4D modelling)
- Drawing Generation (Drawing Production)
- Cost Estimation
- Sustainability Evaluation
- Site Utilization Planning
- As-built Modelling



Q3-06.1 Construction Workflow (To be proposed by Contractor)

Contractors shall be reminded to carry out intensive discipline input and coordination with PTs / PSPs and sub-contractors in achieving the project BIM goals.

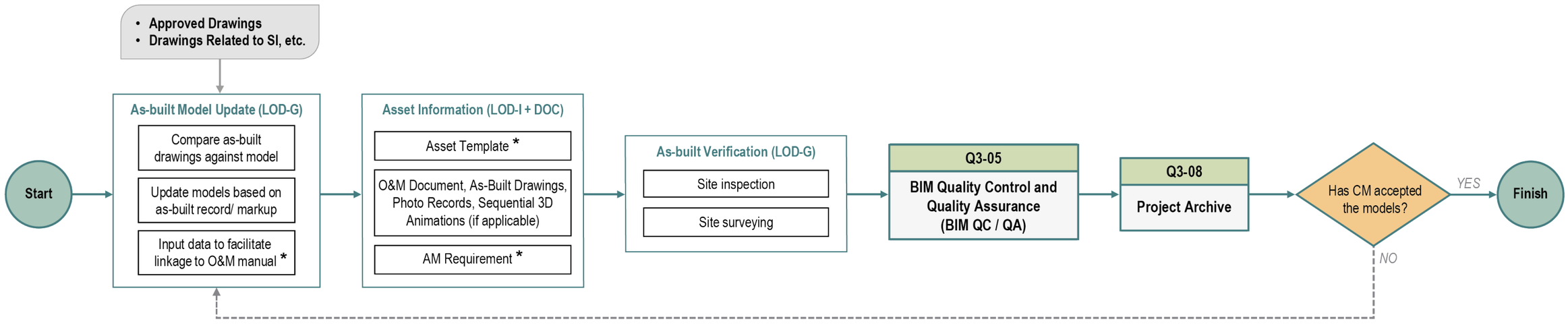
Established project specific detail workflows shall be included in the Project Execution Plan (PxP).

Q3-06.2 Verified As-built Modelling

Once the project reaches as-built stage, the as-built models should reflect the actual physical conditions of the Works. Both LOD-G and LOD-I of the as-built BIM model shall meet the LOD requirement as mentioned in **Vol.2 Section D1. Level of Development (LOD)**.

Once the BIM model is updated, it shall be checked by on site inspection and verification.

The BIM model shall be properly checked with **Q3-05 Quality Control and BIM Quality Assurance (QC / QA) and** complete the **HA BIM Model Compliance Checklist and HA As-Built Verification Report** as compliance on part of the QA requirement.

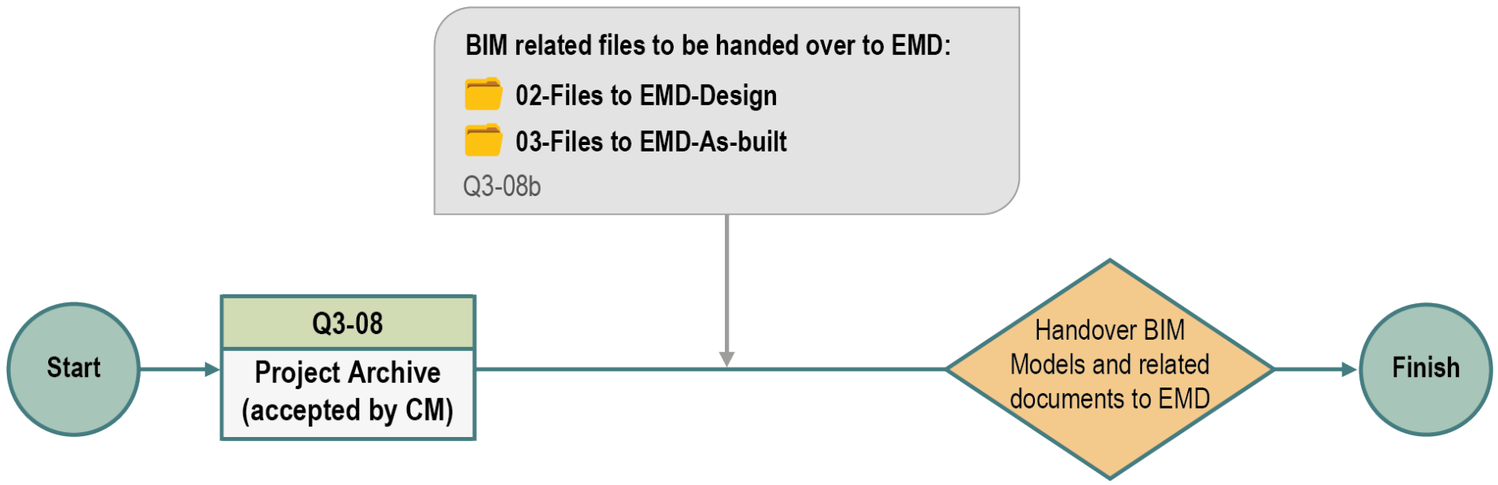


* Only applicable to projects with AM requirement.

Q3-07 Handover of BIM Model at Works Completion

PTs would hand over the project documents like as-built drawings and material approval records to EMD when the construction project is completed. The BIM models and related documents should be treated similarly as other handover documents.

PTs shall refer to Q3-08 Project Archive for the archived BIM models and related documents and select the required items for the handover to EMD.



Q3-08 Project Archive

Proper archiving and record management practices are of utmost importance for any projects. For a BIM project, proper archive of files as a project progresses from one stage to another (e.g. from design to construction stage, and from construction to post completion stage) is of particular importance. This is because the BIM model will be passed on from designers to contractors and from contractors to facility managers and it is important to keep proper archive of files at these stages for reference and record.

Therefore, the following is a brief description of the process and requirements of project archive at these critical stages instead of day to day project archive.

a. From Design to Construction Stage (provision of a set of BIM authoring files to contractors)

It is stated in HA's building and foundation contracts that a Design BIM Model maybe provided to the contractor at contract commencement and the contractor shall make reference of the Design BIM Model to develop the Construction BIM Model. Although it is stated that it is for reference only, project team should archive a full set of BIM related files and passed to the contractor for reference and record.
Since the project team (including PSPs) need to continue to use the Design BIM Model for statutory submissions and other uses at construction stage, the Design BIM Model should be saved as a new set of files for subsequent uses and the archived files kept intact as a record.

The folder structure and file requirements should follow the examples below:

Parent Folder	Description	Required BIM model Format
- 📁 **01-Files to Contractor**	**All BIM related files passed to contractor at contract commencement**	
- 📁 01.1-Design BIM	**Design BIM model files** including master model, block model, typical floor model, MFD models etc.	**Native Format** (e.g. rvt) **Viewer Format** (e.g. nwc) **Open Format** (e.g. IFC)
- 📁 01.1.1 ARCH	**BIM objects** created during project period (including modified BIM objects from existing HA BIM objects) and **Shared parameter lists**	**Native Format** (e.g. rvt, rfa, txt)
- 📁 01.1.2 BSE		
- 📁 01.1.3 STR		
- 📁 01.1.4 CE		
- 📁 01.1.5 GE		
- 📁 01.1.6 LA		
- 📁 01.1.7 QS		
- 📁 01.2-Federated BIM_Individual discipline	**Federated individual discipline of Design BIM models**	**Viewer Format** (e.g. nwc, nwf, nwd) **Open Format** (e.g. IFC)
- 📁 01.2.1 ARCH		
- 📁 01.2.2 BSE		
- 📁 01.2.3 STR		
- 📁 01.2.4 CE		
- 📁 01.2.5 GE		
- 📁 01.2.6 LA		
- 📁 01.3-Federated BIM_Cross-discipline	**Federated cross-discipline of Design BIM models**	**Viewer Format** (e.g. nwc, nwf, nwd) **Open Format** (e.g. IFC)

b. From Construction Stage to Works Completion (provision of a set of BIM related files to EMD)

At project completion, project team should handover both the Design BIM model created by the project team (including PSPs) and the Construction BIM model created by the contractor to EMD. Following the same principles stated above, project team should archive all files handed over to EMD for reference and record.

The folder structure and file requirements should follow the examples below:

Parent Folder	Description	Required BIM model Format
- 📁 **02-Files to EMD-Design**	**All BIM related files passed to EMD at Works Completion by PTs/PSP/BIMSPs**	
- 📁 02.1-Design BIM	**Finalised Design BIM model files** including master model, block model, typical floor model, MFD models etc.	**Native Format** (e.g. rvt) **Viewer Format** (e.g. nwc) **Open Format** (e.g. IFC)
	BIM objects created during project period (including modified BIM objects from existing HA BIM objects) and **Shared parameter lists**	**Native Format** (e.g. rvt, rfa, txt)
- 📁 02.1.1 ARCH		
- 📁 02.1.2 BSE		
- 📁 02.1.3 STR		
- 📁 02.1.4 CE		
- 📁 02.1.5 GE		
- 📁 02.1.6 LA		
- 📁 02.1.7 QS		
- 📁 02.2-Federated BIM_Individual discipline	**Federated individual discipline of finalised Design BIM models**	**Viewer Format** (e.g. nwc, nwf, nwd) **Open Format** (e.g. IFC)
- 📁 02.2.1 ARCH		
- 📁 02.2.2 BSE		
- 📁 02.2.3 STR		
- 📁 02.2.4 CE		
- 📁 02.2.5 GE		
- 📁 02.2.6 LA		
- 📁 02.3-Federated BIM_Cross-discipline	**Federated cross-discipline of finalised Design BIM models**	**Viewer Format** (e.g. nwc, nwf, nwd) **Open Format** (e.g. IFC)
- 📁 02.4-Sheet Files	**Final version of BIM sheet files for approved submissions** including sheet model, reference/ linked model such as block model, typical floor model, MFD models etc. and drawings	**Native Format** (e.g. rvt) **Viewer Format** (e.g. nwc) **Open Format** (e.g. IFC)
- 📁 02.5-BIM QA Report	Completed the final BIM QA report i.e. the Project Startup Checklist and Model Compliance Checklist.	

Parent Folder	Description	Required BIM model Format
- 03-Files to EMD-As built	**All BIM related files passed to EMD at Works Completion by Contractors**	
- 03.1-As-built BIM	**As-built BIM model files** including master model, block model, typical floor model, MFD models etc. for all disciplines	**Native Format** (e.g. rvt) **Viewer Format** (e.g. nwc) **Open Format** (e.g. IFC)
	BIM objects created during project period (including modified BIM objects from existing HA BIM objects) and **Shared parameter lists**	**Native Format** (e.g. rvt, rfa, txt)
- 03.2-Federated BIM_Cross-discipline	**Federated cross-discipline As-built BIM models**	**Viewer Format** (e.g. nwc, nwf, nwd) **Open Format** (e.g. IFC)
- 03.3-Sheet Files	**Final version of As-built BIM sheet files for approved submissions** including sheet model, reference/ linked model such as block model, typical floor model, MFD models etc. and drawings	**Native Format** (e.g. rvt) **Viewer Format** (e.g. nwc) **Open Format** (e.g. IFC)
- 03.4-Shop Drawing	**Shop drawings and detailed drawings**, (if any) for example: • window showing the edge jointing of window frame and structure • prefabricated components such as external cladding/ façade etc. • fire resistance door • water tanks, lift machine room, pump room, transformer room, refuse storage and material recovery room and services rooms etc. • green building features	**Native Format** (e.g. rvt) **Viewer Format** (e.g. nwc) **Open Format** (e.g. IFC)
- 03.5-BIM QA Report	Completed the final BIM QA report i.e. the Project Startup Checklist and Model Compliance Checklist, the As-built Verification Report.	

c. HA Project Archive

PTs to archive all of the above and other BIM related documents in HA's CDE (i.e. ProjectWise).

d. BIM Models and Objects Inventory Lists

For all BIM related files to be archived, they shall be accompanied with the BIM files inventory list. See below Table 1 for example of BIM models and objects inventory lists.

Sample of BIM models inventory list

Parent Folder	Filename	Version
\01-Files to Contractor\		
01.1-Design BIM\01.1.1 ARCH\	HAA-XXXX-BLK1-AR-M3-2F_Tender.rvt	Revit 2020
01.1-Design BIM\01.1.1 ARCH\	HAA-XXXX-BLK1-AR-M3-30F_ ICU.rvt	Revit 2020
01.1-Design BIM\01.1.1 ARCH\	HAA-XXXX-BLK1-AR-M3-31F.rvt	Revit 2020
01.1-Design BIM\01.1.1 ARCH\	HAA-XXXX-BLK1-AR-M3-3F_ICU.rvt	Revit 2020
01.1-Design BIM\01.1.1 ARCH\	HAA-XXXX-BLK1-AR-M3-RF.rvt	Revit 2020
01.1-Design BIM\01.1.1 ARCH\	HAA-XXXX-M3-MASTER.rvt	Revit 2020
01.1-Design BIM\01.1.1 ARCH\	HAA-XXXX-POD-AR-M3.rvt	Revit 2020
01.1-Design BIM\01.1.1 ARCH\	HAG-XXXX-SITE-SI-M3.rvt	Revit 2020
01.1-Design BIM\01.1.3 STR\	HAS-XXXX-BLK1-ST-M3-2F.rvt	Revit 2020
01.1-Design BIM\01.1.3 STR\	HAS-XXXX-BLK1-ST-M3-13F-29F	Revit 2020
01.1-Design BIM\01.1.3 STR\	HAS-XXXX-BLK1-ST-M3-30F.rvt	Revit 2020
01.1-Design BIM\01.1.3 STR\	HAS-XXXX-POD-ST-M3.rvt	Revit 2020
01.1-Design BIM\01.1.2 BSE\	HAB-XXXX-01-BLK-BS-M3-Master.rvt	Revit 2020
01.1-Design BIM\01.1.2 BSE\	HAB-XXXX-01-BLK-DD-M3-1F.rvt	Revit 2020
01.1-Design BIM\01.1.2 BSE\	HAB-XXXX-01-BLK-DD-M3-2F.rvt	Revit 2020
01.1-Design BIM\01.1.2 BSE\	HAB-XXXX-01-BLK-DD-M3-3F-29F.rvt	Revit 2020
01.1-Design BIM\01.1.2 BSE\	HAB-XXXX-01-BLK-DD-M3-MRF-URF.rvt	Revit 2020
01.1-Design BIM\01.1.2 BSE\	HAB-XXXX-01-BLK-FS-M3-2F.rvt	Revit 2020
01.1-Design BIM\01.1.2 BSE\	HAB-XXXX-01-BLK-FS-M3-30F.rvt	Revit 2020

Sample of BIM objects inventory list

Filename	Filename	Version	QTO_Enabled
\01-Files to Contractor\			
01.1-Design BIM\01.1.1 ARCH\BIM Object\	DTL-GNL-HAA-Stair_Signage.rfa	Revit 2020	Yes
01.1-Design BIM\01.1.1 ARCH\BIM Object\	DTL-GNL-HAA-Temp_Refuge_Sign.rfa	Revit 2020	
01.1-Design BIM\01.1.1 ARCH\BIM Object\	FUR-OTR-HAA-Interview Counter.rfa	Revit 2020	
01.1-Design BIM\01.1.1 ARCH\BIM Object\	RAL-SPP-HAA-Bracket_Support.rfa	Revit 2020	Yes
01.1-Design BIM\01.1.3 STR\ BIM Object\	SCL-STB-HAS-Universal Beam.rfa	Revit 2020	Yes
01.1-Design BIM\01.1.3 STR\ BIM Object\	SCL-STC-HAS-Circular-Hollow-Sections.rfa	Revit 2020	
01.1-Design BIM\01.1.3 STR\ BIM Object\	SCL-STC-HAS-Parallel_Flange_Channel.rfa	Revit 2020	
01.1-Design BIM\01.1.3 STR\ BIM Object\	SFD-FPL-HAS-Driven_H Pile	Revit 2020	Yes
01.1-Design BIM\01.1.3 STR\ BIM Object\	RAL-OTR -HAS-Proactive Barrier.rfa	Revit 2020	

Table 1 Example of BIM models and objects inventory lists